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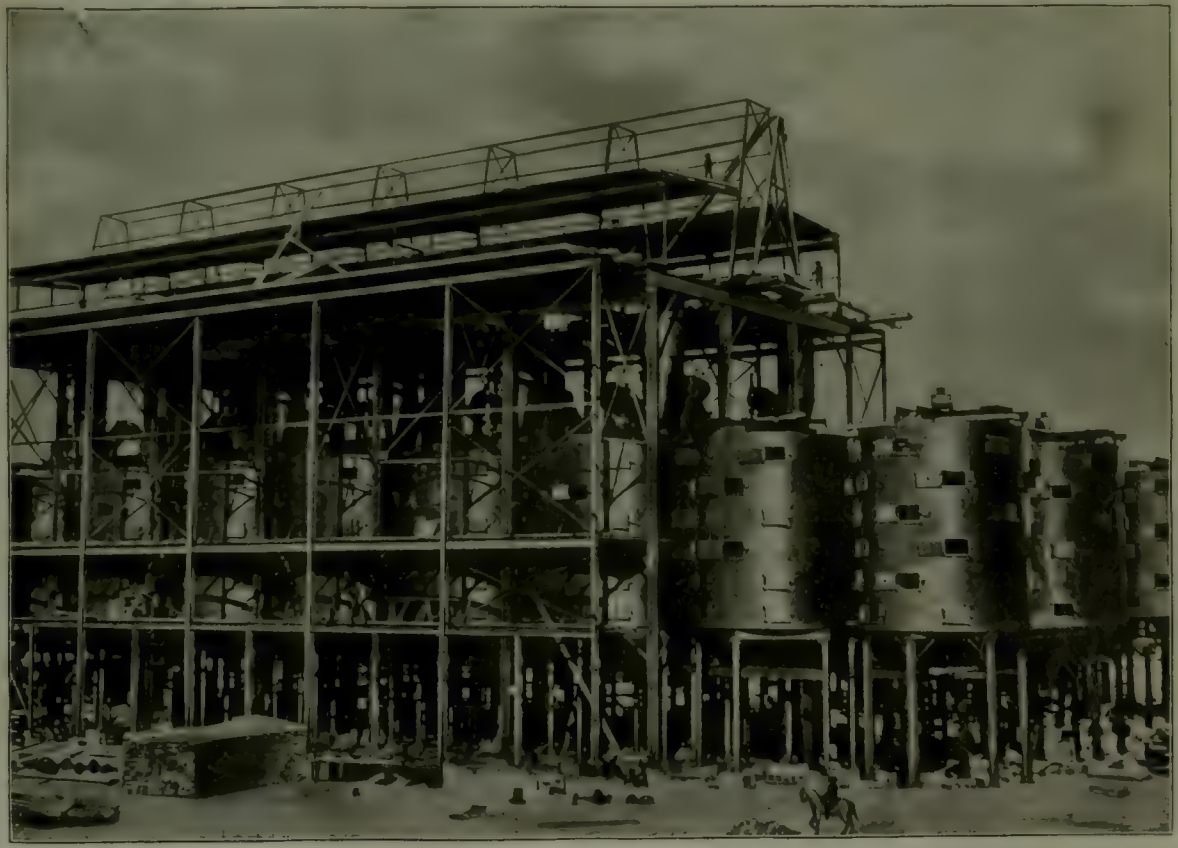

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EDITORIAL

BEFORE this reaches the reader the name of the Director of the Bureau of Mines doubtless will have been announced. Whoever he may be, he will have our good wishes and hearty co-operation, as he will of mining engineers generally.

FREIGHT rates on lead ore from the Coeur d'Alene district to Carnegie, Pennsylvania, have been reduced to $11.40 per ton, 95 per cent of the rate to the Atlantic seaboard, as a result of complaint made by the Pennsylvania Smelting Company.

PRODUCTION in the Goldfield district during the first half of the year has amounted to more than $7,000,000. Dividends declared have totaled $5,443,647, of which $3,664,098 has been paid, and the balance, $1,779,549 will be paid July 31, it being the third consecutive quarterly payment of 50 cents per share made by the Consolidated Mines Company.

CANANEA furnace practice is discussed by Mr. Courtenay De Kalb on another page of this issue with a wealth of detail that is seldom available to the writer of technical papers. Mr. L. D. Ricketts has made the profession his debtor in many ways in the course of his active and honorable career, but in no way more than the frankness with which he has given out technical data. In this he sets an excellent example, and it is a great pleasure to acknowledge our own indebtedness.

SCRANTON, Pennsylvania, being built largely over coal mines, has been endangered in part by caving in the old workings. Popular excitement over the real and fancied dangers has become so great that it is now proposed to have a thorough survey of the ground under the city made by Mr. William Griffith and Mr. Eli T. Conner. It is further planned to submit the results of this survey to an advisory board consisting of Messrs. John Hays Hammond, W. A. Lathrope, Lewis B. Stillwell, D. W. Brunton, and R. A. F. Penrose, Jr., for study and recommendation. It is to be hoped that this plan may be carried through, as it would be sure to result in a clear statement of actual conditions and sound recommendations.

IDAHO has been particularly vociferous, in Washington at least, in complaints against the large areas included in National Forests in that State. It is interesting, therefore, to find the Miners' Protective Association of Pine Creek entering an emphatic protest over threatened depredations by timber companies in territory in Shoshone county just outside a reserve. Our sympathies are wholly with the miners. In any mineral country the timber should

be reserved first of all for use in developing the mines, and attempts to get title to land for the purpose of harvesting the timber, without which it is impossible to develop the mineral claims, call for prompt investigation. In the National Forests the miners have in places and at times been put to unnecessary expense and inconvenience by the Forest Service, but incidentally they have been fully and promptly protected in just such cases as the one cited. Apparently here is one case where the Forest reserve includes too little rather than too much territory.

KOREA is a country of large and little-developed mineral resources, despite a gold output now amounting to over $3,000,000 yearly. Near Wiju it is said that nearly 600 tons of gold ore containing approximately an ounce per ton, is now being crushed in primitive wooden stamp-mills, and the possibilities of dredging at various points on the peninsula are just coming to be recognized. While some of the largest financial houses in Japan are interested in Korean mines, there is need for more capital than is locally available. Relations between Americans and Japanese have been especially friendly in Korea.

Fourth of July

Monday will be the Fourth of July, and throughout the United States, a holiday. To many miners, unfortunately, it is merely a day on which to get drunk, and to many managers, one when the mine does not ship. The good old Colorado rule was a three days holiday—one to get drunk, one to stay drunk, and one to sober up—and the mid-summer spree was as regular as that which marked midwinter at Christmas. Happily not all miners devote the day to this purpose. In many camps there are 'Grand Picnics' followed by equally 'Grand Balls' in the evening. Someway there never was a picnic or ball in a mining camp that was not 'Grand'—at least in the announcements. The picnics are the more interesting. The sports take character from the everyday work of the men, and rare records are made in 'single-jack' and 'double-jack' contests, while teamsters show a marvelous skill and an unwonted energy in loading, unloading, and driving contests. In Gilpin and Clear Creek counties of Colorado, the day is one for annual contests between volunteer fire brigades, and the knights of the ladder and hose cart have doubtless been practising for weeks. In Nevada this year all roads will lead to Reno and long strings of cars will stand on the siding while the 'Hope of the White Race' battles with the 'Pride of the Blacks' to determine whether the miners or the Pullman porters shall have the more legitimately obtained headaches on Tuesday. In other States and in other lands, in thousands of cities and towns, wherever in fact nine Americans can get together, the Umpire will hold up his fingers and say: "Strike two, ball two," and there will be that answering yell: "Now then, Shorty, a three-bagger!"

It is everywhere a day of sport. Many a tunnel and shaft-house will be locked, and many a lone watchman will share his lunch Monday with the chipmunks. In many a lonely underground station the foreman will throw the switch and watch the pumps, for the foreman, of course, is older and already married and realizes that Tom the pumpman must have this day off if he is to keep the blacksmith on the other mine from 'cutting him out' with his girl. Many a miner will shoulder his rod or his gun and start off up the canyon with a wary eye for fish or game, for this is the day for taking that long neglected and much planned fishing or hunting trip. Happily as some such eats his lunch a bit of 'ledge matter' may catch his eye and a second Stratton may locate another Independence, ushering in another Cripple Creek! Whether, however, we hunt, fish, play ball, go to picnic or dance, whether we do any of these or merely with the wiser ones gather our families together and dream in the shade while tired muscles relax and from the blue sky and the yellow sunshine we breathe in health and strength, let us take a moment at least for thought of the significance of the day.

Our forefathers justified the first Independence day by physical combat with the British. That lies so far in the hazy past that we look on it now as merely a family quarrel. We must justify our own Independence day. Unless our National life, measured in its largest sense, be better for the independence of our country, we fail to give reason for standing out alone. We must still contest with the British, though this has become a friendly strife for supremacy in professional success, in governmental efficiency, in social betterment. Are we, let us ask ourselves, now justifying our independence? So long as we may honestly answer this in the affirmative, we may fairly celebrate the Fourth of July; when we cannot, it is time to mend our way or petition for re-admission to the British Empire.

Prices of Spelter

Spelter sold last in St. Louis at less than 5 cents per pound; a price which it has not touched since the new tariff on zinc ores went into effect. At present prices, and with Joplin ore on a $40 basis, there is no margin for the smelter, so furnaces must be closed unless improvement come quickly. The limited demand for spelter seems to be a reflection of the generally unsatisfactory condition in the metal trades. Over 60 per cent of the consumption of spelter in this country is for galvanizing, while 17 per cent of the metal is used in making brass. Decreased consumption of iron and copper must inevitably affect the demand for spelter, and with large stocks of metal now visible, prices are peculiarly sensitive to any decrease in buying. At the same time crop prospects are good and the railways anticipate heavy traffic this fall. That means increased demand for the metals, and it is not likely that spelter, at least, will go lower than at present. Late in 1907 the market for lead was sustained almost wholly by the farmers who, amid all the uncertainties of that disastrous year were busy re-painting their buildings oblivious of the much discussed higher cost of living. It is possible that the farmer by extending his barbed wire fences this fall, may perform an equally valuable service for the zinc miners and smelters.

The New Railway Law

The railway bill finally agreed upon in conference and enacted by Congress is an important and complex measure. It will take many court decisions to determine, not perhaps what Congress purposed, but what it enacted. The final effect of the new law, as relates to commerce and industry, is even harder to forecast. The passage of the law was bitterly contested and it represents compromise, but it is a compromise based on study and not on log-rolling. Few recent enactments of Congress have been more fully and more intelligently debated, and while in its final form it contains nearly all of the features of the law proposed by the President, it has none the less been re-built from terminus to terminus, to its own great advantage. The two leading features of the act are the creation of a Commerce Court and the establishment of the principle that a proposed new rate must be justified before going into effect. Minor changes are the extension of the authority of the Interstate Commerce Commission to cover telegraph, telephone, and cable companies; provision that the Attorney-General shall prosecute cases in place of the Commission, an attempt to revive the 'long and short haul' principle; provision that the Commission may establish rates on its own initiative; prohibition against carriers divulging information regarding shipments that may be used to the detriment of the shipper; requirement that charges applicable to a proposed shipment be quoted in writing; recognition of State laws and courts; and provision for a special Commission to investigate the feasibility of supervising the issue of railway securities. Among the things left out are, (1) any provision for legalizing combinations of railways, and (2) any for making a physical valuation of the railways as one element in rate making. The first was urged by the Administration, and the second by Mr. R. M. La Follette and the 'Insurgent' senators. We think the value of the bill would have been increased by their addition.

Despite various uncertainties as to interpretation of details of the new law, the latter can unhesitatingly be commended. The Commerce Court is well constituted and should prove an important aid in securing reasonable and just railway regulation. Specialization has its place in the work of the judiciary just as it has in mining engineering, and it is wrong that cases should be taken, either by the Government or the railways, to the particular circuit court most likely to give a favorable interpretation. The law should be uniform, and the new court, ranking with the Circuit Courts of the United States and presided over by Judges transferred to it from them for terms of five years each, should give a correct and stable interpretation of the law. The establishment of the Commerce Court will not only relieve the Circuit Courts, but in connection with other changes will also to some extent remove the Interstate Commerce Commission from the anomalous position of being both prosecutor and judge. The new law imposes heavy additional burdens on the Commission and the aid of the Commerce Court, therefore, is most important.

The basis of rate making unfortunately remains unsolved, and the method of comparisons is still to be used with the old stipulation that rates must be 'reasonable'. It is to be hoped that the new commission will devise some effective method of supervising the issue of railway securities and ascertaining the present value of railway property. These matters rest at the bottom of the agitation against higher railway rates. The objection is not against paying a fair rate on a real investment, but against rates fixed to pay an unknown rate based on equally mysterious and evasive figures as to actual investment. The railways maintain that they must raise rates in order to pay suitable dividends on outstanding securities and thus maintain their credit so as to borrow additional sums necessary for improvements and additions. When the enormous sums constantly borrowed by the railways are taken into account the question forces itself as to whether the companies would not do better to make poorer showings as to earnings and borrow less money; in other words replace old locomotives and rails out of earnings instead of issuing bonds or stocks upon which interest must be earned. The Santa Fe has been widely quoted as falling behind in net, despite a marked increase in gross earnings. The reason seems to lie in the fact that a larger amount than usual is being spent on betterments; a very sensible procedure. If the railways cannot live on their present rapidly growing income, why add to the expense by fixed charges due to repeated borrowings? An example of the confusion in statements now made to the public may be instanced the contention of the shippers committee that from 1897 to 1907 the net income per mile on American railways had increased 345 per cent, and the objection by Mr. E. P. Ripley of the Santa Fe that the real increase was 83 per cent. The facts seem to be that the 'income from operation' increased 83 per cent, the figure quoted by Mr. Ripley, but that 'net income from all sources' increased 345 per cent as shown by the shippers. The difference in figures is due mainly to the re-investment of earnings in subsidiary lines.

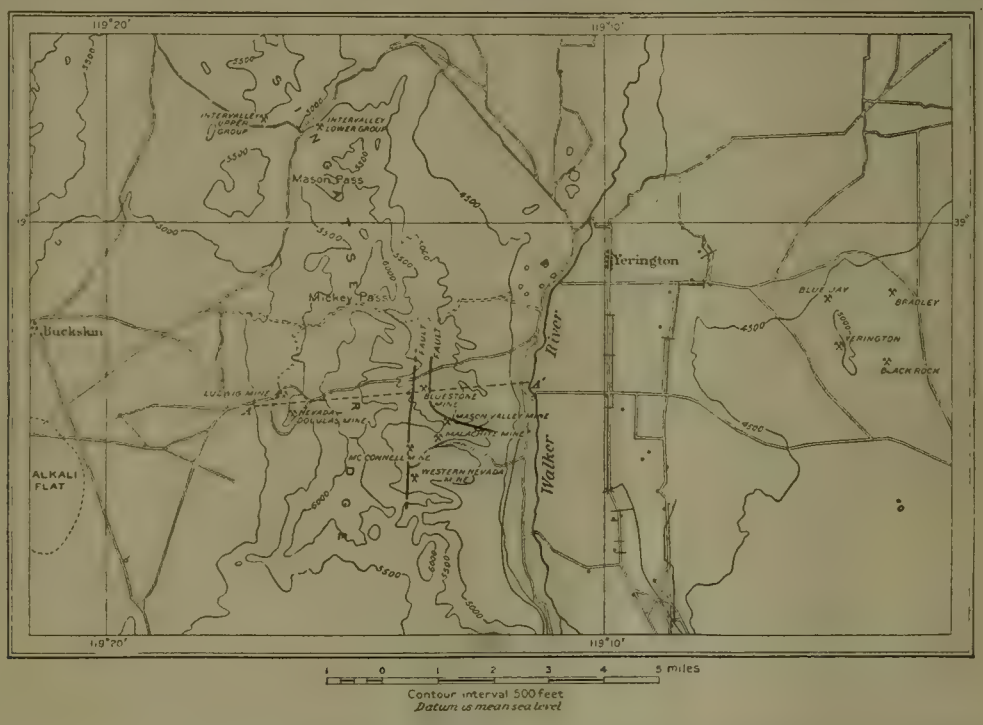
Much has been said recently about 'interference with business by politicians', and even the usually sane and careful *Railway Age Gazette* charges the new law to a desire for votes on the part of members of Congress. We think this a superficial view. The impelling force toward the new legislation must be sought in deeper-lying causes. The significant feature is the public opinion back of this legislation. The railways are not being forced into politics, it is because they have been in politics that the protest has come. It is part of the movement against 'Government by special interests'. As transportation companies, Americans are universally proud of their railways; it is the activity of the railway managers in other directions which makes people suspicious and unwilling to leave in their hand matters, such as fixing rates, that are vital to the public as well as the railways. No one ever had anything but good words for Mr. Harriman as a railway builder and re-builder, but Mr. Harriman, as a manipulator of railway stocks and bonds, is responsible for much of the present insistence that the public shall control the railways rather than the reverse.

The Yerington Copper District

By Jay A. Carpenter.

The Yerington copper district is in the south end of Lyon county, Nevada, 25 miles from the California line and 50 miles southeast of Reno, Nevada. By railroad it is reached by taking the Hazen-Goldfield branch of the Southern Pacific system to Wabuska, and changing there for a short ride of 14 miles to the south on the recently completed standard gauge Nevada Copper Belt railroad. The town of Yerington, from which the district derives its name, is on the east side of the Walker river in the centre of the prosperous and well cultivated Mason valley. This valley is thirty miles long and seven wide, with nearly 50,000 acres under cultivation and an additional equal amount capable of being cultivated when the increased market for farm products warrants the building of storage reservoirs for the flood waters of the Walker river. The copper mines are in the low enclosing mountain ranges both to the east and west, with two of the largest and most promising mines but three or four miles southwest of the town. These two mines, the Bluestone and Mason Valley, are on the east flank of what is known as the Smith Valley range, which separates Mason valley from the parallel Smith valley. On the opposite side of the range from the Mason Valley mine, and facing on Smith valley, is the Nevada Douglas mine. These three are the proved mines of the district.

The railroad follows the west side of the Walker river, and at its closest point to the Mason Valley mine is the railroad town of Mason. This is the present terminus of car service and gives promise of rapid growth as soon as the railroad shops are built and the Mason Valley mine begins shipments. The railroad is being extended south to the head of the Mason valley, and from there it will pass into Smith valley and turn northward to the Nevada Douglas property, giving 26 miles of track where the air-line from Mason to the Nevada Douglas is but four miles. A low pass at the north end of Smith Valley leads into Mason valley, placing the Nevada Douglas within 17 miles of Wabuska by wagon-road. The grade is too steep for a standard-gauge railroad, while the present route of 40 miles to the mine passes near other mines, through both agricultural valleys, and taps tributary territory beyond. The present outside interest in the district after a lapse of three years is due to the construction of the railroad and the announcement of the immediate building of a smelter to handle 800 tons per day. This signifies that the surface prospects that attracted such marked attention in the days of 23-cent copper and were so quickly forgotten thereafter, have been steadily developed, and at depth now show a sufficient tonnage of sulphide ore to justify the large expenditure necessary to provide transportation and reduction facilities.



Yerington District. (After Ransome, U. S. Geol. Survey.)

The credit is to be given directly to two companies, the Mason Valley Mines Co. and the Nevada Douglas Copper Co. Both have been consistently developing their properties to a depth of 600 ft., and have wisely decided to work together in treating the ore. The Nevada Douglass people put in the railroad and the Mason Valley people built the smelter. Liberal contracts have been signed for the hauling of the Mason Valley ore over the railroad, and for the smelting of 200 tons of Nevada Douglas ore at the smelter. This working combination greatly strengthens the belief that the district will make good in the commercial production of copper. The personal credit for the energetic progress made is due to the general man-

agers, George E. Gunn of the Mason Valley and Walter C. Orem, of the Nevada Douglas, and to their consulting engineer, Llewellyn Humphreys, all of Salt Lake. The smelter is to be built on alkali desert land two miles northeast of Wabuska, where water is abundant, but where there is no vegetation for miles. Jules Lebarthe, of Trail, British Columbia is the metallurgist in charge of the design and erection of the smelter. He has established offices in Salt Lake. The track is being laid to the smelter and grading on the site will begin shortly.

The Yerington district first produced copper ores for the market in the early seventies, when the Mason valley farmers gladly hauled the ore to the sulphuric acid and blue-vitrol plants of Dayton for a small sum in ready cash. Following this came the ambitious installation of three or four small matting furnaces, the fuel being charcoal which was burned on the mountains several miles to the west. With the decadence of the Comstock the copper industry of Mason valley relapsed, and the present leading properties were re-located from time to time. In 1900, men from Butte attempted to work the Bluestone mine, installing a 150-ton blast-furnace. By 1905 all the valuable ground was re-located and companies formed to push development, Salt Lake men being in the majority. In the boom times of 1907 approximately 2000 tons of 20 to 30% ore was hauled out by the Nevada Douglas and Ludwig mines, and every worthless ridge in the district was exploited as a copper mine. The Ludwig mine was purchased by the Nevada Douglass Copper Co. for half a million, the Bluestone mine was examined by experts employed by F. A. Heinze, and the Gelders spent thousands in churn-drilling the copper-stained porphyry on the flat west of Yerington in the hopes of developing another Nevada Consolidated. A large amount of honest development was carried on that disclosed in several properties sufficient ore to warrant deeper development in the quiet years that have followed.

The Smith Valley range, in which the principal mines occur, rises above Mason valley to a height of 1000 to 1500 ft., at first in well rounded ridges, then in ridges with table-like tops due to a capping of basalt. The rock that forms the core of the range is a granodiorite, and flanking upon this core are schists and limestones that are irregular in their extent and relation to each other, and show heavy faulting and folding. In many places they show evidence of strong metamorphic action. The metamorphic action in the limestone is evident to the eye in riding over the range; for where the usual light-colored limestone has been altered on certain ridges to a rock having a very high epidote or garnet content, these ridges have a markedly darker and richer color. The Bluestone hill on the Bluestone property and Douglas hill on the Nevada Douglas property show this difference to a marked extent, and on Douglas hill the contrast is sharp enough to be a traceable line. The granodiorite is also termed mozonite, this term being in local favor because of the known association of copper minerals with monzonite in Bingham and Ely. However, in this district the monzonite is not impregnated over large areas with copper minerals, and it is not the ore-bearing formation except in a few of the minor properties where the wall-rock is full of distinct

Ludwig Mine of Nevada Douglas Copper Company.

fissures and has been mineralized with pyrite and chalcopyrite, but hardly sufficient to be of present commercial value. The orebodies that bid fair to be worked at a commercial profit lie in altered limestone with no apparent connection with the granodiorite. They are either in extensive metamorphosed zones like those of the Bluestone mine and Douglas Hill of the Nevada Douglas company; or they are in irregular vein deposits like those of the Mason Valley mine and the Ludwig mine of the Nevada Douglas company. In the garnetized zones of the Nevada Douglas and Bluestone properties the entire zone carries a small but persistent amount of chalcopyrite, but a network of fissures through parts of these areas give richer zones that form the large commercial orebodies. In both the vein deposits of the Mason Valley and Ludwig mines, garnetized limestone carrying copper minerals is present, but does not form the main orebodies. In the Mason Valley the main ore consists of a massive pyrite carrying chalcopyrite, and in the Ludwig mine the primary ore is quartz carrying chalcopyrite, pyrite, and calcite.

The Bluestone mine, three miles southwest of Yerington, was the first property in the district to be developed and the claims were patented in the eighties. At present the property is owned by J. R. DeLamar. The orebody has been developed to a depth of 300 ft. by adits, the lowest of these being a main haulageway 1200 ft. long. In the summer of 1907 a 35-drill electrically driven air-compressor was installed at the mouth of the lowest adit, and a 50-hp. hoist was purchased to prosecute work below that level. Many improvements were made about the property and a force of over thirty men employed. Since the financial depression of 1907 work in the mine has been discontinued. The systematic development in the past has blocked between one and a half and two million tons of copper ore averaging 2¾% copper and about 75c. in gold and silver. Included in the above tonnage is about two to three hundred thousand tons of direct smelting one, but the great tonnage is of the lower grade. This concentrating ore is an altered limestone carrying high epidote with garnet and chalcopyrite, and extends clear to the surface, there being very little oxidized ore. The orebody being over 200 ft. wide with no overburden, will probably be mined by means of an open pit or 'glory-hole' at a very low cost per ton.

The problem of the mine is the metallurgical treatment of the low-grade ore that cannot be smelted direct on account of the low copper content, or water concentrated on account of the heavy gangue minerals. C. A. Weck, the superintendent, after several years of experimental work believes the economical method of treatment is by magnetic concentration after crushing to 8 mesh and giving a slight roast in a tower roaster. With crude oil as a fuel for roasting, and electric power at $5 per horse-power month for concentration and power purposes, the total roasting and concentration costs should be little in excess of those for water concentration. Experimental work has shown that with a concentration of 5 tons into 1, the concentrate will have the excellent smelting composition of: Cu, 12%; FeO, 16; CaO, 25: Al_2O_3, 10: SiO_2, 25; and S, 10. This concentrate carries over 90% of the original copper content of the ore. Since the experimental mill has a capacity of 100 tons per day, the same results should be attained in a large mill. The increased extraction by magnetic concentration should overbalance any extra cost over water concentration. The company can mine, transport, and mill the ore by gravity systems, and it can transport the concentrate to the railroad by a gravity tram approximately a mile long. If a favorable smelting contract can be made with the new smelter this mine may become a producer.

The Mason Valley mine, which lies a mile south of the Bluestone, is in an area having an interesting surface geology. The ore outcrops in a north and south direction on the east side of a limestone ridge, being entirely in limestone. To the north is a black shale formation with a small belt of the same shale approximately 100 ft. wide lying parallel and on the east side of the mineralized foot-wall country. A soft lime shale interposes between this shale belt and an outcrop of andesitic and rhyolitic tuffs. These tuffs being comparatively soft are eroded into steep crests and sharp valleys with many evidences of fantastic wind erosion. These rocks are evidently not intrusive. The surface ore is a fairly pure malachite, and the mine has a record of over 1000 tons shipped from surface pits with over 30% copper content. The mine was purchased in 1906 from Mr. Sprague, a rancher of Mason valley, by the Gunn-Thompson interests of Salt Lake. Consistent development has been carried on for over three years, opening the vein for a length of 1000 ft., and to a depth of over 500. This work has been through adits. No. 1, 300 ft. long, was driven by hand through garnetized limestone to the vein at a cost of $30 per foot. The vein at this depth, 100 ft., was dipping to the east and had changed to a heavy garnet pyrite ore carrying chalcopyrite. Adit No. 2 was started by hand work in the garnet lime to cut the vein at 200 ft. depth, but with the advent of electric power a 75 hp. compressor was installed at a lower point, from which point adit No. 3 was driven 1000 ft. to cut the vein at a depth of 350 ft. Over half the distance was driven through the garnet limestone. The work, done with piston drills, cost $15 per foot. The development on this level was carried on by driving in the garnet rock to the north and south, as, near the vein, it carries chalcopyrite, and is similar to the Nevada Douglas ore. After intersecting massive pyrite farther to the west and finding it to average over 4% in copper for 200 ft. along the vein and over 50 ft. wide, and finding also that although this ore blended gradually into the garnet limestone it ended sharply on the opposite side along a fissure with a barren limestone beyond, further development was carried on with the idea of cutting through the garnet rock to the fissure and following it with cross-cuts at frequent intervals back through the vein to the garnet limestone. This method gave a cheaper and more rapid development of the mine. The massive pyrite, with more or less chalcopyrite, was found to lie along the fissure in variable width, but at 500 ft. south of the first large orebody the vein widened and reached an average 3½% copper

content for a distance of 800 ft. until at the south end of the property it is sharply faulted. On this level the vein dips slightly to the west which is opposite to the dip on the level above. Adit No. 4 was driven 2000 ft. to cut the vein at a depth of over 600. Most of this distance was through soft lime shale, and the adit was driven with piston drills at the rate of 150 ft. per month and a cost of $7 per foot. On this same material drifts have since been driven with small hammer drills of the Waugh type at a cost of $3 per foot. Drifts on this level run directly under the north ore-shoot of the level above failed to intersect the ore, and this was the cause of adverse rumors. Raises intersected the ore and by driving south a distance of 180 ft. the orebody was found again, which shows this ore-shoot to have a steep pitch to the south. On development the ore proved to be equally as good as on the level above, much of the latter being above a 2% grade. The ore now counted on for direct smelting is in the large ore-shoots in the vein and contains over 1½% copper content. An estimate of the amount of this ore blocked is 600,000 tons.

At the present time the superintendent, J. J. Welch, has started a stope on the north ore-shoot on the third level and on the south ore-shoot on the fourth level for the purpose of determining the cost of extracting the ore, and to get a better idea of the average copper content. The method of stoping employed is to leave 12 ft. of ore in place above the level to protect the latter and to provide ore pockets, and then after the first horizontal cut with piston drills to mine by the shrinkage stope method, using small hammer-drills. The firmness of the ore and wall rock makes possible this method of mining without timbering, and greatly reduces the cost. The

Stoping in Mason Valley Mine.

Development of this level from the first was carried on by driving to the south on the fissure and crosscutting the ore at an average of 50-ft. intervals. The south ore-shoot was found directly under its position on the third level, and was of equal magnitude. A winze sunk on the fissure at this orebody continues in ore and seems to show that the vein again dips to the west, which is favorable, since it carries it away from the black shale belt that had been approaching closer with depth, with a consequent narrowing of the garnet-lime zone.

The conception of the fissure vein and the developmen on the third level, leading to the more scientific development of the fourth level, has taken the property from the category of 'irregular bodies or ore in a replaced limestone' to a distinct vein deposit of pyrite and chalcopyrite, formed on the east side of a north and south fissure. The vein is of variable width, grading into a garnet-lime ore to the east, stope on the third level is now 30 to 40 ft. wide and over 100 ft. long. The mining cost in this stope at present is given at less than 75c., and with active mining operations it is estimated at 60c. In the stope on the fourth level the mining cost is now $1 per ton, because of the greater amount of garnet gangue present. The car samples from these stopes have given ½ to ¾% higher copper content than the original sampling of the level and raises.

The company spent $180,000 last year in development, and with the present stopes opened along the length of the smelting ore the mine is fast rounding into shape to furnish its quota of 600 tons per day to the new smelter. The present question is the method of connecting the mine with the railroad, which is at a distance of 1¾ miles and with a drop of 600 ft. in elevation from the portal of adit No. 4. An aerial tramway can be used, but a survey is being made to see if it is possible to bring a railroad grade

far enough up the slope to allow direct loading into railroad cars from the portal of a lower adit to be over 4000 ft. in length and 200 ft. deeper on the vein. The latter plan looks beyond present outlay of capital to the future handling of the ore and possible mine-water below adit No. 4. Above this the mine is comparatively dry.

Although the surface ore is entirely oxidized and oxidized ore in small bodies is found even on the lowest levels, there is little secondary enrichment to chalcocite and cuprite, the oxidized ore passing almost directly into the solid pyrite and chalcopyrite ore, this latter being considered the primary ore.

The property of the Nevada Douglas Copper Co., consisting of over 30 claims, lies three miles to the west of the Mason Valley mine on the opposite flank of the range. It includes two groups of claims, the Nevada Douglas and the Ludwig. The main orebodies of the Nevada Douglas group lie in a garnetized limestone. The main orebody on Douglas hill shows a series of fissures, the strongest being a north and south series, which series is intersected by east and west and northeast-southwest series, the whole giving a network of fissuring. These fissures were simply channels along which the depositing solutions found there way into the adjacent limestone, giving irregular orebodies without definite walls, but often extensive in size. The higher grade ore occurs at the intersection of the fissures, and of this about 1500 tons was freighted out to the railroads in 1907. The composition of this shipping ore was 15% Cu, 0.01 oz. Au, 0.5 oz. Ag, with 23% SiO_2, and 20% FeO. This ore has a distinctive appearance of its own, being locally known as 'spot ore'. It is a mixture of small even-sized but irregular shaped grains of chalcocite, malaconite, bornite, chalcopyrite, pyrite, and garnet.

Development on Douglas hill was carried on by an adit at a hundred foot depth, with raises to the surface and winzes to an additional depth of 50 to 70 ft. This one garnetized zone extends over a large area, being roughly 600 ft. wide and 2500 ft. long. On the western end, 2000 ft. west of and 600 ft. below Douglas hill workings, is the Casting shaft, which is 80 ft. deep and has fair ore. A tunnel 600 ft. long was driven from near this shaft toward the upper workings, and with its raises, winzes, and cross-cuts adds a large tonnage of ore assaying better than 3½% in copper. The estimates of the tonnage developed on the Douglas group, due to the irregular shape of the orebodies, vary from 200,000 to 500,000 tons of better than 3½% copper ore which, mixed with Ludwig ores, can be smelted direct. Besides this tonnage of direct smelting ore there is a vast quantity of 1½ to 3% ore which, on account of the garnet gangue and partly oxidized condition, offers a difficult metallurgical problem. Two other garnetized zones on this group have been only slightly developed. The total amount of work on the group is about 7000 ft., which is but a meagre amount toward the possible development of the large mineralized areas.

An 18-drill Ingersoll-Rand compressor and a 100-hp. hoist were installed at the Casting shaft in 1907 with the intention of sinking 500 ft., but with the purchase of the Ludwig group, which had already attained a depth of 500 ft. from a point approximately on the same level, the deeper development was shifted.

The Ludwig group is of small area, but contains a vein that shows on the surface for hundreds of feet as an iron-stained gossan some 30 ft. wide. Oxidation extends to a depth of 500 ft., giving carbonate ores in a silicious iron-oxide and calcite gangue. Below this level the ore is quartz and calcite carrying sulphides. The vein has a north-south trend with a dip of 48° to the east. It occurs in limestone near the line of contact of a hard crystalline limestone on the west and a softer impure variety to the east. In the limestone to the west is a wide belt of hard pure gypsum. Dikes of altered porphyritic rock have been found on the extreme south drifts at the 500-ft. level that carry sufficient chalcopyrite to be ore of commercial grade. The width of the vein is considered to be 80 ft., but the walls are irregular and there are large and frequent horses of pure calcite. Below the 500-ft. level there is a sharp change to sulphides, and the 550-ft. level is in the zone of secondary enrichment. Here are found lenses of chalcocite and of cuprite carrying native copper. On the 650-ft. level there are still secondary ores on the footwall side, but it is believed that the remaining sulphide ore is near to being the primary sulphide ore. This vein furnishes a striking example of the copper vein as usually described in text-books, beginning at the surface in a gossan and becoming richer with depth in beautiful azurite and malachite ores, which in turn give way to heavy black chalcocite and red cuprite ores with green copper-water standing in pools, with copper-sulphate crystals coating the walls of poorly ventilated drifts, and below this a plain quartz sulphide ore with clear mine-water.

Up to the time of the purchase of the Ludwig group the mine had been worked with the idea of making profits on shipments of high-grade ore, with the result of expensive gophering without showing the possibilities of the property. To the 400-ft. level the mine was worked through a vertical single-compartment shaft in the hanging wall, and to the 550-ft. level by an incline sunk 200 ft. to the east of the shaft from the 400-ft. level. Heavy flows of copper-bearing waters had resulted in the installation of costly bronze-lined steam-pumps. The Nevada Douglas company put in a 2000-ft. line of 6-in. air-pipe from their compressor to the old boiler-plant for the hoists and air-drills, and pushed development on the 500 and 550-ft. levels, with sinking to the 650. By 1909 there were 1200 ft. of drifts on the 500-ft. level, 2000 on the 550, and 750 on the 650, giving an estimated reserve of 200,000 tons of direct-smelting ore above the 500-ft. level, and 325,000 of the same from the 650 to the 500. This was considered sufficient to justify plans for reduction works, and since that time the general manager has devoted himself to the building of the railroad, and the superintendent, Samuel S. Arentz, to putting the mine in shape to produce the necessary daily tonnage. The system of two small independent hoists had made development costs excessive. The underground incline has been extended through to the surface as a two-com-

partment shaft. This was done entirely by Waugh drills and without timbering, the broken rock being drawn just enough to give a free working face. The head frame has been carried high enough to allow for ample ore bins from which the ore will be loaded direct into the ore cars. Work will soon begin on an aerial tram from Douglas bid to the railroad below. The company plans to ship 200 tons per day of the various ores to give an average composition of 5.25% Cu, 24 to FeO, 32 SiO, 7 to 10 CaO, and 3 to 6 Al_2O_3. Like the other ores of the district, there is no zinc and mony or other troublesome element in the ore.

At present the Yerington district is very quiet from a mining standpoint, the activity being concentrated on the railroad and smelter construction, but with these completed the district will become a steady copper producer.

JAPAN'S MINERAL OUTPUT

Official figures show an increase of from 6 to 20% compared with 1908 in the production of the chief minerals. The following is an official résumé of the production:

	Amount.	Value.
Gold	9,933 lb.	$2,483,300
Silver	341,360 lb.	2,258,795
Copper	1,146,130,496 lb.	11,494,770
Lead	8,577,053 lb.	223,807
Bismuth	992 lb.	754
Tin	47,568 lb.	11,979
Antimony	536,020 lb.	23,040
Quicksilver	1,352 lb.	549
Zinc	60,719,200 lb.	155,399
Pig iron	118,011,499 lb.	826,080
Steel	15,697,541 lb.	211,417
Sulphide	72,176,150 lb.	68,567
Manganese (?)	17,619,019 lb.	28,190
Arsenic	17,702 lb.	461
Phosphorus	3,628,499 lb.	8,328
Graphite	757,498 lb.	13,828
Coal	14,973,617 tons	30,546,179
Peat	94,300 tons	82,591
Kerosene	41,675 gal.	3,184,962
Sulphur	94,621,040 lb.	366,625

KOREA'S MINERAL PRODUCTION

The following is the official report of the mining industry in Korea for 1909:

	Number men.	Number mines.	Area acres.
Gold	277	116	45,200
Silver	10	7	1,480
Copper	42	29	11,270
Mercury	2	2	340
Graphite	173	109	24,900
Coal	69	34	13,460
Zinc	5	3	1,370
Others	165	89	36,600

The total amount of gold obtained in Korea in 1908 and 1909 respectively was about $2,500,000 and $3,056,000 in value. The annual production of gold from the mines at Unsan is about $1,500,000 in value, according to the Seoul *Press*, and that of Synnan, which is worked by Soichiro Asaro, is $140,000, while the annual output of gold and alluvial gold taken from the mines at Chicksan amounts to $60,000 and $29,000 respectively.

Cananea Furnace Practice

By Correspondent to M. & S. P.

The following notes deal with a number of the more vital details of practice, and represent the excellent character of the work being done at the great smelter of the Cananea Consolidated Copper Co. under the direction of L. D. Ricketts, the general manager. The plant in operation contains six blast-furnaces and one reverberatory. A second reverberatory is under construction, and will soon be in commission. The blast-furnaces are 48 by 210 in. at the tuyeres, and at the top they measure 5 ft. 2 in. by 7 ft. at the inner edge of the jackets, and 7 by 17 ft. inside the hopper at the feed floor. In height they are 11 ft. 11 in. from the top of the base-plate to the inner edge of the jacket, and 13 ft. 6 in. from the top of the base-plate to the top of the hopper. On the base-plate are laid two courses of clay-brick, making a bottom-lining 10 in. thick. The water-jackets consist, for each furnace, of a total of 12 on the sides, 2 ft. 11. in. by 12 ft. 6¾ in., and two right-hand and two left-hand jackets on the ends, 9 ft. 7¼ in. high and 2 ft. 6 in. wide at the bottom by 3 ft. 1 1/16 in. wide at the top. All jackets have a 5-in. water-space, and are made of plates, ⅝-in. steel being used on the inside and ⅜-in. on the outside.

There are 36 tuyeres per furnace, three in each side-jacket, each tuyere having a diameter of 5 in. The total quantity of jacket-water circulated is 340 gal. per minute per furnace, which is at the rate of 1757 gal. per ton of wet gross charge. The water enters the jackets at a temperature of 70 F., and leaves at a temperature of 105. The capacity of each furnace is 280 tons of wet gross charge per diem, of which coke constitutes from 9 to 11%. The individual charges weigh approximately 2100 lb. each, and five such lots are charged to each furnace about every 30 minutes. The height of full smelting-column is 8 ft. 11 in., measured from the centre of the tuyeres. The furnace is carried full to the upper inner edge of the jackets. The labor required for the six furnaces is 1 foreman, 2 chargers per shift, and 1 feeder, 1 helper, and 1 coke-wheeler per furnace per shift. The air-pressure is maintained at an average of 16 oz., the average temperature of the blast-air being 64°F., with a mean humidity of about 31%. The temperature of the blast-air varies between the limits of 73 and 56°F. The dust-loss amounts to 8% of the gross wet charge.

The flues from the furnaces to the bottom-flue are 6 ft. diam. The balloon-flues are two 'goose-necks' 8 ft. 6 in. diam., and two balloon-flues 12 ft. 6 in. diam., with an area of 135 sq. ft. each, leading to the dust-chambers. The latter consists of a main and a stack-chamber, made of brick, covered by a roof of rails and concrete. The flues to the stack have brick walls and a sheet-steel roof. The dust is settled by retarding the velocity of the gases by means of an increasing area of dust-chamber. The main dust-chamber is 60 by 181 ft., by 32 ft. 6 in. high, the area for passage of gases being 970 sq. ft. The flue to the stack is 20 ft. wide by 19 ft. 6 in. high, and 242 ft. long, and the chamber at the base of the stack

is 84 by 34 ft. in horizontal section by 23 ft. 6 in. high. The stack is self-supporting, made of steel 19 ft. 9 in. inside diameter, lined with 9-in. common brick, leaving, net, an area for the passage of gases having a diameter of 18 ft. 3 in. The height to the top of the stack above the foundation is 168 ft. 3½ in., the foundation being 25 ft. above the level of the ground. The temperature of the gases at the bottom of the stack is 450° Fahrenheit.

The charge carries Fe 26.5%, Cu 6.39, and S 17.11, this being figured on the gross weight. The mixture is calculated to produce a bi-silicate slag, the average composition of which over a considerable period is:

	Per cent.
SiO_2	39.00
Al_2O_3	9.20
FeO	36.30
CaO	11.10
ZnO	1.50
MnO	0.53
MgO	0.48
Cu	0.40
S	0.70

The matte-fall, under the conditions obtaining in regular work, is about 18%. The matte has the general composition:

	Per cent.
Cu	37.4
Fe	34.8
S	26.1
SiO_2	0.5

Other bases, arsenic and antimony, are not determined. These are small in amount. No speiss is produced. The coke used assays:

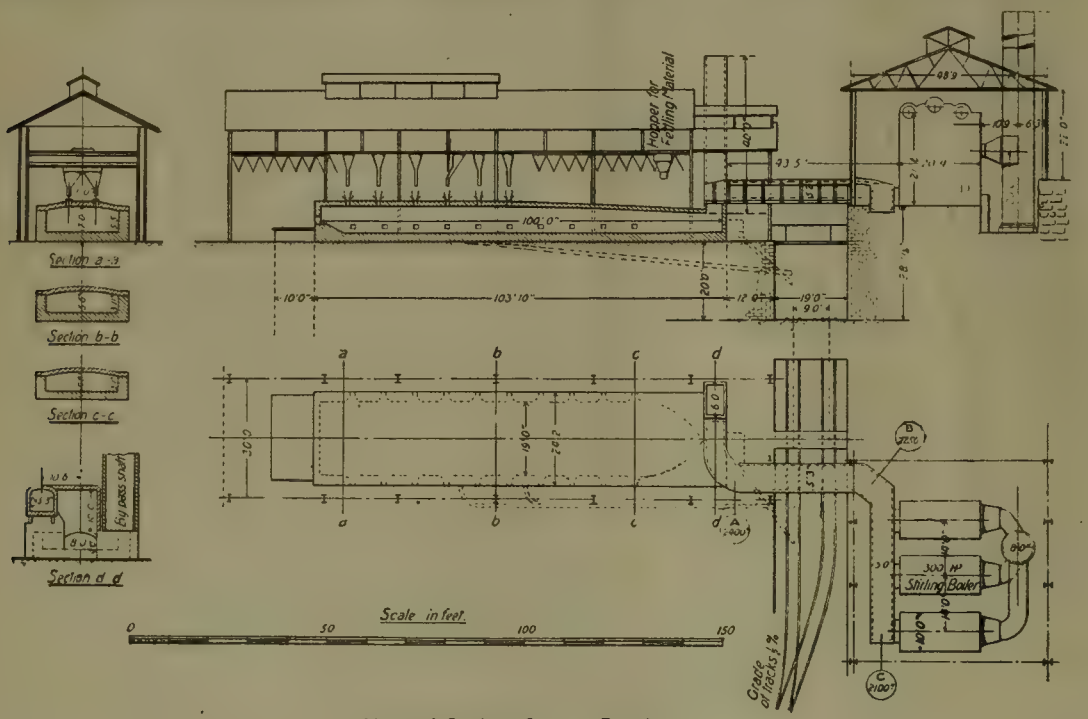
	Per cent.
Moisture	0.65
Fixed carbon	78.79
Volatile matter	2.02
Ash	18.40

The ash shows on analysis:

	Per cent.
SiO_2	53.5
Al_2O_3	23.2
Fe	11.4
CaO	4.6

The forehearths or settlers are made of steel plates ¾ in. thick on the sides and ¼ in. on the bottom. The forehearths are oval, 8 ft. 6 in. long by 4 ft. high, with a radius at the ends of 7 ft. The lining on the sides is of siliceous converter-tamping for 12½ in., faced with 9 in. of chrome-brick. The bottom is of clay-brick, 10 in. thick, except under the furnace-spouts and at the tap-hole where the top-layer is made of chrome-brick for an area of about 9 sq. ft. The frequency of tapping from the settlers depends, of course, on the speed of the furnaces, and on the grade of the matte. When running about 280 tons of charge per furnace, making 30% matte, a tapping is made every hour. Each tapping draws off from 4 to 7 tons. During the period of 2½ years that these forehearths have been in service one lining has been re-built, and two linings out of the four settlers in commission, have been repaired. No repairs have been needed upon any of the shells to date. The furnaces are connected to the forehearths by copper water-jacketed spouts, having 2-in. water-spaces. The wear comes principally on the nose, which needs occasional patching. Four of these have needed repairs up to the present time. The furnaces have been in service two and a half years during which only slight repairs have been made to the jackets.

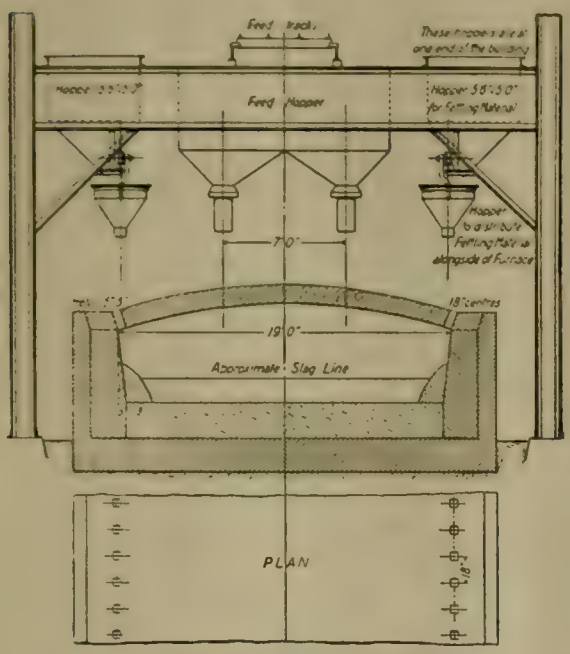
For the most part it is aimed to keep the tuyeres dark, but no trouble is experienced in keeping them bright. They are barred out at least three times per day, and punched every three hours. Wall accretions in the furnaces give no trouble. They are



Plan and Sections Cananea Reverberatory.

barrel cover at the beginning of each 8 hour shift, and [illegible] necessary. When not pouring converter slag into the settlers very few accretions form there. A gradual freezing of the ends farthest from the furnace spouts occurs, however, because of defective ventilation. There is also a tendency to thickening of the roof, which is easily remedied.

Corresponding to the six blast-furnaces are five stands of converters, the shells measuring 96 by 135 inches. The converters are blown through 14 cast-iron tuyeres 1¼ in. inside diameter each. The blast-pressure is 12 lb. at the power house, and the temperature of the blast air is 64° F. The charge varies from 4 to 7 tons of matte, which is blown from 30 or 32 to 60% copper in from 40 to 60 minutes, this time including that consumed in pouring 'taps' from the settlers, skimming slag, and all operations about the converter except 'punching up' new shells, finishing the charge, and pouring the copper bullion. The



Cross-Section Cananea Reverberatory.

time depends on the size of the 'tap', condition of the converter, and other circumstances. Sufficient raw matte is then poured into the converter to make a proper finishing charge. Charges which will pour from 25 to 90 bars of bullion apiece will take from 20 to 40 minutes to finish. The total matte treated per diem by the battery of converters is about 217 tons; the consumption of lining 71.5 tons; and slags skimmed 95.8 tons. The converter slag after the first pour, from 60% matte, has the following composition:

	Year 1909, per cent.	April 1910, per cent.
SiO_2	26.8	21.5
Al_2O_3	6.2	7.4
FeO	58.3	60.9
CaO	1.5	1.2
S	0.8	1.1
Cu	2.44	2.50

The composition of the slag from the finished charge has not been determined. The matte is blown to blister assaying 99.1% copper.

A new lining for a converter-shell requires 10.3 tons of material. The ore used for this purpose, which comes from the mines of the company, has the following composition:

	Per cent
Moisture (H_2O)	5.60
SiO_2	56.00
Al_2O_3	14.20
FeO	5.40
CaO	1.70
S	5.50
Cu	2.49

One lining will suffice for 24 tons of raw matte, or 8.9 tons of blister copper produced. Ten to thirteen shells are lined per day. These are dried by an oil-flame, 2.93 bbl. of Oklahoma crude-oil being required to dry out one converter-lining in about 10 hours. The matte ladles, of cast steel, have a holding capacity of 68 cu. ft., and last about three years. The slag-cars have a capacity of 45 cu. ft., the bowls now in use having been in service for 2½ years. The converter-house is served by one 40-ton and one 50-ton crane, with 50-ft. span, requiring 13.6 hp. The converter gases are conducted through a 4-ft. flue to a stack 5 ft. diam. The total labor required per diem is as follows:

	Shifts. Number.	Hours.	Total men per day.
Blast-furnace charging floor	3	8	72.6
Blast-furnace slag-floor	3	8	61.1
Converters, including cranes	3	8	43.6
Lining gang	2	8	52.4
Clean-up gang	1	10	24.4
Bullion gang	1	10	6.2

The total air requirements, in terms of horse-power per ton of raw matte (30 to 32% Cu) produced and charged are: blast-furnaces, 0.0651 hp.; converter-blowing, 0.0728; converter-rotating, 0.00098; crane-work, 0.00207. The converters take 5230 cu. ft. of air per minute per converter, or 220,000 cu. ft. per ton of bullion produced.

The reverberatory practice at Cananea, which has included some of the most interesting metallurgic pioneering undertaken in America, was fully described by L. D. Ricketts in the Bulletin of the Institution of Mining & Metallurgy, November 28, 1909, under the caption 'Experiments in Reverberatory Practice at Cananea, Mexico'. The accompanying cuts show the furnace substantially as it is today, including dimensions. The notable circumstance in connection with Mr. Ricketts' work has been the adaptation of crude-oil as fuel. This has led to many economies in actual cost of fuel, in labor, and in repairs. The lines of the furnace, originally designed for burning coal-slack, have proved so nearly correct for oil-fuel that the only important change in the design for the new furnace, now being erected, consists in a greater elevation of the arch above the hearth-bottom in the 30 ft. of the rear of the furnace, that is, nearest the fire-box. The flame has a tendency to corrode the arch in the present furnace at that point. Four Shelby oil-burners are used, which enter the fire-box through ports in the rear wall. The fire-bridge remains as when coal was

employed. At the present time the average consumption of oil is 216 bbl. per diem. Taking the maximum and minimum for April 1910, the charge treated varied between 242 and 293 tons per day; the corresponding oil-consumption being 221 and 238 bbl., or 0.77 to 1.05 bbl. per ton of charge. The waste heat from the reverberatory generated steam in the Sterling boilers set in the flue-course in quantity sufficient to give a credit for fuel to the reverberatory varying from 0.33 to 0.48 bbl. of oil per ton of charge smelted. Thus the net consumption chargeable to smelting was only 0.43 to 0.57 bbl. per ton. The burners are operated under a steam-pressure of 125 lb. Other details concerning the economy of oil in reverberatory smelting can be found in the paper by Mr. Ricketts, cited above.

The number of charges per diem is about 20, all dumped through feed-hoppers in the arch toward the rear of the furnace. The charges are not spread, but are allowed to melt down and distribute themselves. The oil-flame is not shut off, nor dampers closed in the flues, while charging. The charge is made up of the following materials:

AVERAGE CHARGE FOR YEAR 1909.

	Per cent.
Flue-dust	70.87
Calcine	17.74
Flux	6.35
Fettling (raw ore)	5.03
Miscellaneous	0.01

The analyses of flue-dust and calcined concentrate are shown below:

	Flue-dust, per cent.	Calcine, per cent.
SiO_2	27.96	30.78
Al_2O_3	6.15	5.35
Fe	29.92	30.02
CaO	2.02	?
S	11.06	7.14
Cu	7.56	9.20

In the month of April just passed the percentage of flue-dust and calcine used were respectively 37.14 and 51.51, and the proportion of flux was 5.08%. The reverberatory slag has the following composition:

	Per cent.
SiO_2	38.8
Al_2O_3	10.0
FeO	37.9
CaO	7.6
S	0.8
ZnO	1.9
MnO	0.32
MgO	0.28
Cu	0.45

The reverberatory matte, which represents a matte-fall of 24.97%, gives the following results by analysis:

	Per cent.
Cu	32.0
Fe	35.9
S	28.9
SiO_2	0.46

One of the most interesting and unique features of the reverberatory practice here consists in fettling with green silicious ore, such as is used for converter-lining. This is crushed to a maximum of ½ in. diam., and is fed to the fettle-line through small ports in the arch just inside the side-wall lining. The ports are 5 by 5 in., and are spaced 18 in. apart. The fettling is dumped upon the arch and hoed into the holes, thus falling into place, and requiring no further labor to protect the lining from corrosion along the slag-line. When not fettling the ports are closed by tapered fire-clay plugs. In this way, an operation, which in ordinary practice constitutes part of the cost, becomes here an economical means of smelting a refractory copper ore. Material as coarse as ½ in. diam. cannot be fed in the charge successfully.

The preparation of flue-dust for blast-furnace smelting has been attempted many times by mixing the dust with refinery or with converter-slag. The success has not been complete, and the cost of handling has usually proved high. Mr. Ricketts has devised a simple system which has yielded an ideal product for the blast-furnace, and at a cost so low as to equal the advantages of treating flue-dust in the reverberatory. A shelf was excavated in the side of the slag-dump to give a foundation for a slag-car about 14 ft. below the upper track, and about the same height above a receiving-bin at the bottom. On the track-level above are provided a hopper for receiving flue-dust, and a hopper with a spout for conveying molten slag to the slag-car below. A spout also extends from the dust-hopper to a point over the centre of the slag-car such that when the slag is being poured, and forms a vortex in the molten mass in the bowl, the flue-dust will be discharged in the centre of this vortex, and be drawn down into the slag, thus becoming uniformly mixed with it. When the slag-bowl is full, it is dumped over the steep side of the slag-pile, down which it rolls as a viscous mass. It balls up as it tumbles downward, and forms so-called 'bombs', not unlike the balls of fritted cinder in a cement-kiln, except that they are of larger diameter, ranging from ½ to 12 in. The red-hot 'bombs' are sprayed with water from a hose, being quenched as coke is quenched on being drawn from the oven. The 'bombs' are of good tenacity, will bear handling exceedingly well without disintegration, and are porous and permeable to the blast. The converter-slag will take up about 20% of either flue-dust or raw concentrate. The FeS_2 present is largely reduced to FeS, thus facilitating the formation of matte, and adding to the speed of smelting.

German copper trade in 1909 showed some increase over 1908. It is stated that 194,449 metric tons (of 2,204.6 lb. each) of copper were consumed, about 5000 tons over 1908. About 90,000 tons were used for electrical installation, 38,000 for manufacturing plates, bars, and tubing, 41,000 for making brass, 2000 by chemical factories, and about 23,000 by shipyards, railroads, and for copper fittings and armatures. Germany produced 31,009 tons of copper, including that made from imported ore and scrap. The world's production of copper in 1909 is estimated at 834,940 English tons, in which the following countries were the principal participants: United States, 487,020; Mexico, 56,250; Spain and Portugal, 53,000; Japan, 45,000; Australia, 38,350; Chile, 35,800; Germany, 23,500 tons.

Stanley Butte District

By F. Wirt Jr.

The formation in the Stanley Butte mining district, in Graham county, Arizona, 18 miles south of San Carlos by wagon road, consists chiefly of granite and albite of the Archean system. On the granite lies conformably a belt of quartzite of the Upper and Lower Cambrian series. Paralleling and lying conformably on this is a belt of Carboniferous limestone. The sedimentary rocks all have a southeasterly dip of about 15°. The quartzite zone itself is some 400 ft. in thickness. The overlying Carboniferous limestone is more than 600 ft. thick. The entire zone is intersected by porphyry dikes, upon which and adjacent to, copper ores are found. These ores upon the surface are mostly carbonates and oxides, but at shallow depths, in places, sulphide ores have been exposed. There are, at the present time, two companies operating in the Stanley Butte district. The Copper Reef Con. Mines Co. is now driving an adit, which is in 370 ft. Development is being carried on rapidly, and the company is planning to increase the present force of 24 men. As soon as two 40-hp. hoists, already shipped from Lansing, Michigan, are received and installed, the sinking of two double-compartment shafts over 3000 ft. apart in the main lode, will be commenced. A long deep adit for drainage and easy handling of the ore is contemplated. Surveyors are at work preparing maps of the property. The original purchase was supposed to include 80 claims. Recent additions will increase the number to about 120. The Cobre Grande Co., holding a group of 14 claims, and under the management of A. F. S. Cooper, is working 12 men. An orebody, 30 ft. wide, has been recently developed at a depth of about 125 ft. This orebody is a sulphide, and averages 4% copper, though portions of the vein show a high percentage. At the present the Iron adit is being driven to tap the new orebody at a greater depth. The Yellow Metal group, which lies in the middle of the district, is under option to Eastern men. This group consists of some 60 claims, and has good surface showings of carbonate and oxide ores. The Starlight mine, a group of 12 patented claims, owned by the Tri Bullion Co., of New York, is at present not on the active list. This mine was worked years ago by the early Spaniards, and contains gold, silver, copper, and lead ores. The Friend adit is in some 800 ft. This property is owned by Blake & Harvey. The Phoenix & Eastern railroad will probably resume construction work on its proposed route through the Box canyon of the Gila river, at an early date. Its present terminal is Winkleman, and it is the intention to connect with the Gila Valley, Globe & Northern at San Carlos, thus establishing a direct and shorter route through Arizona. The Territorial Board of Control has surveyed a wagon-road from Globe to Douglas, by way of San Carlos, Stanley, Klondyke, Wilcox, and the Sulphur Spring valley. Construction work upon this territorial high-way will shortly be commenced.

Globe in Relation to Physiographic Regions of Arizona.
(After Ransome, U. S. Geol. Survey.)

PERMISSIBLE EXPLOSIVES

Prior to 1909 little information was available to coal operators or State mine inspectors relative to the liability of explosives to ignite coal dust or coal gas, and thereby to cause explosions, except the information or supposed information contained in the claims made by manufacturers of a few so-called safety powders. Early in 1909 the United States Geological Survey undertook to test the explosives on the market. On May 15, 1909, the Geological Survey issued Explosives Circular No. 1, and on October 1, 1909, Explosives Circular No. 2, giving lists of permissible explosives. On May 16, 1910, a third list was issued, including all permissible explosives tested up to that date. This list shows that fourteen additional explosives have been placed in the permissible class since the issue of Circular No. 2. These are as follows:

Aetna coal powder D, Aetna Powder Co., Chicago, Illinois.

Coal special No. 3-B and coal special No. 3-C, Keystone Powder Co., Emporium, Pennsylvania.

Eureka No. 2-L. F., Tunnelite No. 6-L. F., and Tunnelite No. 8-L. F., G. R. McAbee Powder & Oil Co., Pittsburg, Pennsylvania.

Titanite No. 3 P, Waclark Titanite Explosive Co., Corry, Pennsylvania.

Trojan coal powder A, Trojan Powder Co., Allentown, Pennsylvania.

Detonite special, Detonite Co., Cincinnati, Ohio.

Monobel No. 2, Monobel No. 3, Carbonite No. 4, and Hecla No. 2, E. I. du Pont de Nemours Powder Co., Wilmington, Delaware.

Kanite A, W. H. Blumenstein Chemical Works, Pottsville, Pennsylvania.

The production of quicksilver in the United States in 1908, as obtained by the Geological Survey from returns from mines producing during that year was 19,752 flasks of 75 pounds each, valued at $824,146.

Well Drilling Machines for Copper Prospecting

By W. G. Weber

*The machines now in use in Arizona are of the traction type. Both Keystone and Star outfits are used. Drilling practice is practically the same in all cases, so the following description of Miami methods is applicable to all.

Before drilling can be commenced an adequate water supply must be provided, and this was not always easy in the Miami district. Water is pumped from wells, springs, or underground workings, through pipe-lines as much as three miles long, to tanks placed at the highest points on the ground to be drilled, and thence through temporary lines to the machines. Between an actual shortage of water in periods of drought and the freezing and bursting of these temporary lines in cold weather, much time may be lost.

The ground to be prospected is divided into 200-ft. squares, each corner being marked as a drill-hole location. Roads are then built to these locations, the road work being kept far enough in advance of the drills to avoid delays on this score. As the roads must be at least 9 ft. wide and substantially built, and as the surface of the ground prospected is almost invariably rough, these roads are quite an item of expense. Moreover, since they can seldom be used for any other purpose, they must usually be charged entirely to drilling. The roads should not exceed 15% in grade. A drilling machine can pull up a steeper grade, but the team of horses hauling the coal and supplies must be considered.

When a machine arrives at a location, it is blocked and leveled; the drive wheels are disconnected from the engine, and the spudding arm is attached to it. The mast is raised and steadied with wooden braces and with $\frac{5}{8}$-in. steel guy ropes. A floor, 14 by 18 or 20 ft., built of 2-in. plank, is laid in front of the machine; in the summer a simple roof of corrugated iron is built over this floor, sides and ends of the same material being added in winter. A longitudinal opening about 3 ft. wide is left in the roof to allow the handling of casing and tools. Water tanks and a portable coal-box are also placed before drilling commences.

The string of tools for starting a hole, or 'spudding in', usually consists of a 10-in. bit, 4 in. by 20-ft. auger-stem, and rope-socket. The tools are strung up, a hole is cut in the floor where they will drop, and work commences. When spudding, the cable passes direct from the tools over the crown pulley, down to the spudding wheel, and thence to the drum where the excess cable is wound. This spudding line is generally a section cut from a worn drilling cable; $1\frac{7}{8}$ to 2-in. manila cable is used. The spudding wheel is moved on an arm in such a way as alternately to raise and drop the tools in the hole. As the depth increases, cable is unwound from the drum, so that the tools may always strike a fair blow on the bottom. When about 5 ft. of progress has been made, the cable is thrown off the spudding wheel so that it passes direct from the crown pulley to the drum; it is then wound on the latter, pulling the tools out of the hole. A bailer is then lowered into the hole on $\frac{7}{16}$-in. steel line wound on a separate reel. The bailer is often made of casing pipe, 4 to 8 in. diam. and 10 to 20 ft. long. A dart valve on the bottom opens when the bottom of the hole is reached, thus admitting the sludge. The bailer is then hoisted to the surface and emptied into a trough which conducts the sludge to the sampling device. The bailer is run until the hole is dry, or all the cuttings have been removed. It is then swung back out of the way, the drilling tools are run back into the hole, and spudding is resumed. A varying amount of water is needed in the hole to keep the tools cool and to take up the sludge. When the natural flow is not sufficient, this water is thrown in from the surface.

With a Keystone machine, spudding may be continued to a depth of several hundred feet. With a Star machine, however, the wear and tear on machine and cable are too great, and consequently the Star driller 'hitches on' as soon as practicable, generally at a depth of from 100 to 125 ft. Then, instead of carrying the motion up over the crown pulley and back again, the rope is attached by clamps and a temper-screw to a beam extending out over the hole, and operated by a crank and pitman. That part of the cable above the clamps is not used while drilling is going on, but is pulled aside out of the way. In pulling out, the cable is unclamped, the pitman taken off the crank, and the beam is pulled up out of the way, and the cable is then wound on the drum just as when spudding. A pair of short-stroke jars is inserted in the string of drilling tools between the stem and the rope-socket.

A drilling crew consists of two men—a driller and a helper or 'tool dresser'. There are two crews to a machine, each working a 12-hour shift, changing at noon and at midnight. When moving or casing, both crews work in the daytime. Holes are drilled on the average to a depth of 500 ft. or until below the limits of commercial ore. The rate of drilling is quite variable, depending on the rock found, the depth, and the amount of water flowing into the hole. With a 10-in. bit in average dry rock, which stands up well, 40 or 50 ft. per shift is not uncommon. On the other hand, shattered and silicified schist which tends to cave and settle in the hole, and soft sandy schist and granite which tend to run in at the bottom, are often found in the Miami district, and in such material a drill may work a week or so and make little or no progress; in fact, the ground may come in faster than it can be drilled out. The presence of much water in a deep hole may also retard drilling, both by flotation of tools and cable, and by resisting the motion. In such cases it appears advisable to use a wire cable, with 100 to 150 ft. of manila cable, inserted immediately above the tools to absorb the shock and lessen the strain on the machine. The accompanying table shows in a general way the variations in the rate of progress with respect to depth of hole and nature of work.

It is evident that in shallow holes, the time re-

*Abstracted by *Engineering Contracting* from the *Wisconsin Engineer*.

quired for moving and setting up may become a prominent factor in determination of the average rate of progress. Under delays are included shut downs, drilling had been cleaning out after casing and except in No. 2 time spent in fishing for tools lost in the hole. A drilling machine is expected to average 750 ft. a month, everything included. Delays in drilling may be due to various causes, as noted above, some of the chief of these being briefly explained here.

Crooked holes and that holes sometimes interfere. Theoretically a drill hole should always be vertical, round, and to gauge, but either through carelessness on the part of the driller or otherwise, variations from the ideal hole are many and troublesome. As a result the bit sticks or the tools lag and do not hit an effective blow. The common remedy is to fill the hole up above the bad place with fragments of quartz gathered on the surface, and then re-drill it. Sometimes a four-winged star is used in place of the

	Time (hours)						Depth of hole (ft.)	Depth of permanent water level (ft.)	Rock	Kind of drilling	Feet per 24 hr.
	Drilling	Repairs	Delays	Moving	Casing	Total					
1	72	11	12	41	..	136	103	...	Granite	Fair	18.2
2	17	12	60	45	14	303	252	...	Granite and schist	Poor (caving)	19.9
2	(Same as above + total time finishing)					648	252	...	Granite and schist	Poor (caving)	8.8
3	...	...	...	...	...	336	340	(?)	Schist	Fair	24.3
4	...	...	..	...	...	456	421	290	Schist	Fair	22.1
5	...	...	...	...	...	420	427	(?)	Granite and schist	Fair	24.5
6	369	8	113	47	43	580	468	320	Granite and schist	Poor (caving)	19.4
7	...	..	...	...	...	468	505	300	Schist	Fair	25.9
8	487	5	120	52	66	730	527	15	Schist and granite	Poor (wet and caving)	17.3
9	292	6	197	47	33	575	555	255	Granite	Poor (caving)	23.3
10	481	37	44	40	34	636	608	465	Granite	Fair	22.9
11	...	...	...	...	...	588	635	380	Schist	Fair	25.5
12	376	32	86	35	...	529	645	(?)	Granite	Good	29.3

regular bit and extra wide rope sockets are also used to reduce the play of the upper end of the tools in the hole. Shooting the hole with dynamite is occasionally attempted with but rather indifferent success. In spite of all precautions few drill-holes are vertical or straight, the tendency being to deflect a foot or two in a hundred.

Cavings, or pieces of rock falling from the sides of a hole, may seriously delay drilling, as well as interfere with sampling. Large quantities of rock often fall suddenly on the tools and may wedge them in so tightly as to make is necessary to cut the cable, if indeed it does not break, and fish for them with a second string. Sands running in from below may produce the same effect. These cavings occasionally fill the hole as much as 50 ft. or even more above the bottom, and even if they do not catch the tools, much time is lost removing them. Usually casing the hole will stop the caving. Three sizes of casing are used in Miami, 7⅝, 6¼, and 4½ in. diam., weighing 8 to 13 lb. per foot. When a hole is cased, it is necessary to use smaller bits and tools. Four sizes of bits are used, 10, 7⅝, 6¼, and 4½ in., these figures representing the diameter when dressed to gauge. With the last named bits a smaller string of tools, 3¼ in. diam., is used.

A hole may be cased several times if necessary. Each size of casing reaches to the top of the hole and all are removed when the hole is finished. When casing is being handled, the drilling tools are lashed to the mast, and usually the manila cable is unwound from the drum, a wire cable being put on in its place. With this line, the joints of casing, each 18 to 20 ft. long, are hoisted over the hole one by one, threaded together, and lowered until the bottom is reached, or until they will go no farther. The casing rarely needs to be driven, and then only with light blows, this being accomplished by stringing up the tools and dropping them gently on a block placed on the upper joint of the casing. To remove casing the process of lowering is reversed. When it does not pull readily, pulley blocks or hydraulic jacks or both are used, and occasionally dynamite is lowered into the hole and exploded to jar the ground loose. There are also a number of special tools, such as steel nipples, casing spears, and the like, used in special cases and better described in the makers' catalogues than is possible here.

Finally, a serious factor in delaying drilling is the fishing job. The cable or one of the tools may break, a joint may become unscrewed, or the tools may be wedged so tightly by sudden falls of ground or runs of sand, that the jars will not work, and the rope must be cut. Then the fishing job commences. Many and various tools are kept ready for emergencies, for it takes weeks to get anything from the supply houses. A fishing job is delightfully uncertain; it may last an hour or a week, or the hole may eventually have to be abandoned. In the last case, a new hole is usually started a few feet away. A second and a third string of tools may be lowered into a hole, to recover the ones already there, only to be lost in turn. Sometimes when success seems assured, some unexpected occurrence puts things in worse

shape than before. Thus in one hole, a bit broke off at the pin, and the driller lowered a horn socket gently, to feel for the part remaining and learn, if possible, how it lay. The horn socket is aptly described by its name, resembling a megaphone somewhat in shape, and in this case it slipped over the bit and took just enough friction hold to bring it along to the surface and then drop it back in the hole, where it remains yet, all further efforts to recover it proving unavailing.

The object of this drilling is, of course, to obtain information concerning the ground penetrated. For this purpose the sludge is bailed out at 5-ft. intervals, approximately the true depth being determined each time by measuring on the line. The sludge is dumped into a trough and conducted to a split divider which diverts one-eighth of the material into a tub. This amount may subsequently be reduced to $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$ if desired, by re-pouring the contents of the tub through the divider. The sludge is then dried over a fire, care being taken to prevent loss of sulphur through roasting; and the dried sample, which should weigh 25 or 30 lb., is sacked, tagged with the number of the hole and the depth at which it was obtained, and sent to the assay office. A sampler is employed on each shift to do this work. When two machines are working close together he can attend to both. He also takes a portion of each sample and pans it, noting the copper and iron minerals present, and their approximate abundance. The sulphides and oxides concentrate in the bottom of the pan; the copper carbonate and silicates are washed off, but may readily be detected even in minute quantities because of their bright colors. This and other information is recorded on a report blank.

The nature of the rock penetrated may be determined by the relative quantities of various minerals found in the sludge, and also by examination of such small uncrushed fragments as are often bailed out. When the formation is not the same from top to bottom, and the hole is caving, the exact nature of the rock penetrated may be indeterminable. Faults and veins are quite readily detected in the capping over the ore through the presence of clay in the sample, also through marked variations in the amounts of iron oxides, copper carbonates, or quartz present in the sample. The width of the fault is represented by the distance through which this marked difference in mineralization occurs, but when the fault is steeply inclined, this is of course much greater than the true width. Faults in the sulphide zone are not so readily detected and doubtless are often overlooked.

A coal-dust burner using a jet of compressed air instead of a fan blast has been in successful operation for the past two years in a southern cement factory. Air at high pressure passes through a Koerting ejector nozzle and enters the kiln through a horizontal pipe. A vertical fuel supply pipe opens into the horizontal pipe just beyond the discharge end of the nozzle and between the nozzle and the kiln, the rapidly moving air jet carrying the coal dust into the furnace.

Less Known Gold Dredges in California

By W. M. Knox

Among the many successful dredges in California, outside of the well known Feather, Yuba, and American River districts, there are several isolated ones of which little is known that are working with good results. The following notes, while incomplete, are representative.

On Scott river, Siskiyou county, a 7 ft., close-connected bucket, electric-driven dredge was operated until quite recently. The machinery was furnished by the Link-Belt Company, of Chicago. The boat has a capacity of about 60,000 yd. per month; its hull is 110 by 45 by 7 ft., and the stacker 94 ft. long. It was digging 33 ft., below water, in very tight gravel, and some boulders have been found that the buckets could not handle. The company generated its own electric power with two Pelton wheels of 350 hp. and has sufficient current not only for its boat, but a lighting plant also. The gold saving devices are of the Holmes type, and have an area of 960 sq. ft. A revolving screen with about 3600 sq. ft. of area is used. The water requirements for pond and boat are about 350 in., obtained from the river. The boat has already dredged about 25 acres out of a ranch of 500 acres which the company controls.

On McAdams creek, a tributary of Scott river, in Siskiyou county, is the Siskiyou No. 1, a 5-ft. boat, which is working in 40 ft. of loose gravel. It began operation this year. The dredge was constructed by the Yuba Construction Co., and is equipped with Bucyrus machinery.

In the Horsetown mining district, on Clear creek, Shasta county, the Shasta Dredging Co. is operating one 5-ft. close-connected bucket dredge, with a capacity of 50,000 cu. yd. per month. The hull is 95 by 40 by 8 ft., with a stacker of 90 ft. long. At present the boat is working in shallow ground 15 ft. below water and 3 ft. above. The creek gravel is very loose, but on the benches the gravel is compact and does not cave, though no powder is used. The power is electrical, and a total of 200 hp. is consumed by the different motors. The actual running time is about 80%. The gold saving devices have 1680 ft. of riffle surface obtained by placing part of the sluices outside of the housing, while the revolving screen is 6 ft. diameter by 30 ft. long. The water required is 50 miners' inches for pond and boat, and costs about $40 per month. The company controls 350 acres. The monthly costs per yard run from 2¾ to 6c.; the average would probably be about 5½c. Nine men are employed.

In the Mokelumne River mining district, on the Mokelumne river, near Wallace, is an electrically driven, 6-ft., close-connected-bucket dredge, built by the Mokelumne River Mining Co., which is working 70% of the total time. Its hull is 40 by 90 by 6 ft., with a stacker 80 ft. long. In December this boat was digging 25 ft. below and 4 ft. above water-level in fine well-washed gravel. Regular Holmes-type gold-saving tables are used, with machinery furnished by Allis-Chalmers Co. All water for pond and

boat is taken from the river by gravity flow. The company controls 196 acres, of which 145 acres remain to be dredged. The total cubic yardage for 1909 was 450 000. Twelve men are employed.

At Snelling, Merced county, on the Merced river, the Yosemite Dredging & Mining Co. is operating a 4½ ft. close-connected Bucyrus dredge. The hull

Yosemite Dredge, on Merced River, Equipped With Bucyrus Machinery.

is 40 by 70 by 6 ft., with a stacker 64 ft. long. The boat is working in loose river wash 15 to 21 ft. deep, no boulders, and works about 77% of the total time. The electric power consumed amounts to about 130 hp. and is generated at the railroad, two miles distant from the boat, by a distillate engine. Ordinary wooden gold-saving tables are used as gold saving devices. The water for washing and pond is taken from the river by gravity. The company controls 340 acres and has dredged to date 21 acres. About 3 oz. of platinum is saved monthly. It is of interest that this company can make its own power from distillate and run such a small boat.

The Quinner machine, which is now attracting attention in Sonora, consists of a cylinder about 6 ft. long and 3 ft. diam., made of steel slats with interstices ¼ in. wide. To a steel shaft passing through the cylinder are attached chains 3 in. apart and arranged in spiral form. At the free swinging ends of these chains are steel slugs 6 in. long and 3 in. diam., which clear the cylinder by about 3 in. The shaft revolves 375 times per minute, while the outside cylinder turns in the opposite direction 28. By centrifugal force the chains stretch out and the slugs strike a blow of 1800 lb. in one round. The spiral arrangement acts like a grinder and discharges the hard pebbles of the conglomerate from the end of the cylinder, while the cement which contains the gold grains is pulverized and passes through the interstices of the cylinder into troughs below. This powder is then treated by the ordinary dry-washer process. The pulverizer uses no water, and the only water required in the boiler of the engine.

Shasta Dredge on Clear Creek.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Pig-iron production in Canada during the fiscal year ended March 31, 1910, was 740,244 tons, and steel production was 740,390 tons.

Gold in granite country is common in California. Many of the granites in the Mother Lode districts contain gold-bearing veins in the granite, but the shoots in these are not usually extensive.

The tunnel on the Jungfrau mountain line is being driven at the rate of 10 to 12 ft. per day. The line is expected to be opened to an elevation of 11,090 ft. in the spring of 1912, and will eventually be carried to 13,670 ft., or only 242 ft. below the summit.

Rubber growing among the natives in Dutch Southeast Borneo is going ahead rapidly under official prompting. Government land has been granted to hundreds of natives for that purpose. In the district of Amuntai there are extensive plantations of Rambong rubber. Several planters, who have been buying there, have formulated a scheme for buying this rubber from the growers and for working it up on the spot. Native rubber growers have ordered large quantities of rubber seedling from Singapore.

A thunder-storm observatory has recently been established in Spain by G. J. de Guillen Garcia. By means of a wireless telegraph instrument the electromagnetic waves set up by lightning discharges are detected graphically and acoustically, the changes in the intensity and the distinctness of the sounds produced in the receiver giving the observer a clue as to the probable path of the storm and the rate of its movement. After a sufficient amount of data have been obtained it is hoped that forecasts of these storms will be made possible.

The average consumption of fuel per brake-horse-power hour in gas-producer tests made by the United States Geological Survey was 1.36 lb. of bituminous coal, or 1.99 of lignitic coal, the minimum consumption being 0.84 and 1.48 lb. respectively. Comparative tests of 75 bituminous coals under a water-tube boiler and in the gas producer showed that the average fuel consumption per brake-horse-power in the steam-plant was 2.7 times that in the producer plant. Several low-grade coals and lignites that were of little value, or even worthless, under the steam-boiler gave excellent results in the producer.

The Heroult electric furnace at the McKeesport plant of the Firth-Sterling Steel Co. has a capacity of two and one-half tons of charged material. The arc is formed between the electrodes and the bath of metal and the current which passes through one carbon, passes through the bath and out of the other carbon. These carbons project down vertically through water-cooled jackets on top of the furnace, which is lined with magnesite or dolomite. The Heroult furnace is nothing more than a modified open hearth, wherein the heat is applied above the metal by the electric current instead of gas. In order to maintain constant load a regulating device is used. This electrically operates two motors on the furnace whereby the carbons are raised or lowered. Power is obtained from three-phase mains and stepped down from 11,000 to 110 volts.

Wolframite is a tungstate of iron and manganese. It is the ore from which the metal tungsten is usually obtained. About one-fifth of the world's supply now comes from Argentina. One mining company, the Hansa Sociedad de Minas, produces six-sevenths of the entire Argentine output. It mines 60 to 100 tons of ore per month, ranging from 65 to 75% pure wolfram. The price of wolfram is about $1 a kilo (2.2 lb.) of pure metal. The amount of metal in a ton is estimated by the Government Chemical Assayer in Hamburg, Germany, where the ore is shipped. Prices are quoted there.

The life of a boiler generally depends upon the amount of corrosion to which it is subjected. With good feed-water which will neither corrode the metal nor cause a deposit of dangerous scale, and proper care to keep the surfaces of the metal clean, a life of forty years is not uncommon. With slow corrosion the life may be reduced to five years or even less, with the additional inconvenience that the pressure of steam which may be safely carried is continually being reduced. It is customary to analyze the feed-water if impure, and subject it to such chemical treatment as will render it fit for service.

The pollution of air in mines is sometimes due partly to the emanation of gases from the surrounding rocks, but principally from the following artificial causes: (1) respiration of persons and animals, (2) combustion of the candles and lamps, (3) absorption of the oxygen by pyrite and other minerals, (4) putrefaction of timber, (5) explosion of powder, and (6) dust from boring. Of these the decay of timber underground is one of the most important, and it should be urged that the practice of leaving the useless decaying timber to infect the new pieces put in, sometimes making a level a hotbed of putrescent matter, is both offensive to the senses, and injurious to the men.

Manganese ore is now being shipped from South Africa. The 5000 tons recently cleared for Antwerp, are stated to be part of an order for 150,000 tons, to be executed within the next two years. Already 13,000 tons more of manganese and about 7000 of iron ore are ready for shipment. Although the ore now being shipped to Antwerp contains phosphorus, and is therefore unmarketable in the United States, the company's officers believe that some of its mines, still undeveloped, will produce manganese without phosphorus. The mines are on a mountain a few miles from Cape Town, and the ore is dropped through chutes to carts, which convey it to the jetty, whence it is carried on barges to the ship.

Special Correspondence

BRITISH COLUMBIA

B C Copper Co Takes Management of New Dominion — Hedley Declares Dividend — Important Discoveries on Portland Canal —Vancouver Coal Items – Ainsworth and Slocan

It is officially announced that the British Columbia Copper Co has taken the active management of the mines of the New Dominion Copper Co. Development has been started on the Rawhide property and it is likely that shipments will be begun as soon as the two furnaces now undergoing enlargement at the Greenwood smelter are finished. The Brooklyn property of the same company is being unwatered with a view to diamond-drill exploration in that ground. Harry Johns, superintendent of the Jackpot mine, will also have the superintendence of the new work in this vicinity. The first annual meeting of the New Dominion Copper Co was held in New York June 6. A report covering the fiscal year ended March 31 showed $307,502 on hand. The sum of $30,371 was carried forward into the new year. Paul S. Couldrey, who for nearly a year has been superintendent of the B. C. Copper Co. Mother Lode mine, Greenwood, has gone to Peru. Mr. Couldrey has been succeeded by E. Hibbert, who formerly occupied a similar position with the Le Roi No. 2, Ltd., at Rossland. The Hedley Gold Mining Co., which controls the Nickle Plate mine at Hedley, has declared dividend No. 3 to the amount of 3%. This company began paying dividends in August last, and since that time has paid approximately $90,000 in profit sharing to the stockholders.

At Rossland the Jumbo mine was examined during the past week by O. F. Riebel, expert for Finch & Campbell, of Spokane. A couple of thousand tons of gold bearing ore has been shipped from this property and nearly $150,000 expended in development. There is between four and five thousand feet of work done in the mine. It is anticipated that Mr. Riebel's report on the property will be such as to warrant the resumption of work. It is expected that work will take a more active turn now at the Yankee Girl mine at Ymir, as H. L. Rodgers, manager, has returned from New York, it is rumored with plans for working on a larger scale. Gen. Molineaux and his son, principal stockholders, are making an inspection of the mine.

A large body of free-milling gold-bearing rock has been located near Stewart, on Portland Canal. The find is in the vicinity of Bitter Creek and the lode is stated to have been traced for twenty miles. It is 30 to 100 ft. wide and assays return an average of $6 over five claims. The find has excited the large number of prospectors in and around Stewart, and many are rushing to stake claims on the lode, which can be traced with the eye over the mountain ranges. There is talk of erecting a smelter at Goose Bay, on Portland Canal.

The Western Canada Investment Co. has enlarged its holdings in Graham island coal section from six to sixteen, thus covering 21 square miles of ground. The output of the Dunsmuir collieries is to be augmented to two million tons per annum.

In Ainsworth division, a Scottish syndicate has let a contract for driving a tunnel 300 ft. on the Swede group, Poplar creek. A new French company, the Emissions Minieres, Ltd., is putting a Pelton 5-ft. water-wheel and a Fraser & Chalmers 16 by 18-in. belt-driven air-compressor on the Joker group, at the head of south fork of Kaslo creek, and will drive a tunnel 800 ft. The Selkirk Mining Co. is repairing its flume, preparatory to resuming mining and concentrating at its Cork mine and mill, which produce silver-lead, but cannot yet make a marketable product of the zinc ore. The Flint and Bismark are also being worked. The Government is making a trail to the Utica, five miles from the railway, on which nine buildings are being erected. On the Whitewater group, new ground is being explored for other shoots of ore in the Whitewater Deep, and the raise from the lowest level—that of the Deep Mine, Ltd.—is being made 150 ft. before cross-cutting for the vein. The Whitewater mill has been started, treating white silver lead and silver-zinc concentrates on hand are being shipped. Slocan mines promise increased tonnage. The Ramona Consolidated has shoots of good silver-lead ore on both the 900 and 800 ft. levels and the 1000-ft. is also being driven to cut these. The mill is again at work, concentrating ores on the dump left near the mouth of the old Hall tunnel, years ago. Results of exploration at and below the 900-ft. level are justifying the expenditure incurred in driving a long crosscut at the 1150-ft. level. Nine men are working on the Washington. The Payne is to be examined by Messrs. Vicl of Montreal, Quebec, for the Sandon Mine syndicate which has a lease and option on the Payne mine and mill. The Ruth Hope mill will concentrate ore from the Ruth and turn out two products, namely silver-lead and silver-zinc concentrates. The Hope has good shipping ore exposed ready for stoping; a new adit is to be started on the vein at 200 ft. vertically below No. 4. The Slocan Star is driving on its Slocan King and Hidden Treasure claims, cutting several ore-shoots and making raises to give ventilation before opening stopes. These drifts are to be extended into the Consolidated M. & S. Co.'s Eureka and Summit claims lying behind the Slocan Star group. A baby tram is being

Mineral Resources of British Columbia.

erected from the portal of one of these adits 500 ft. to the upper terminal of the Consolidated company's aerial tramway from the Richmond-Eureka mine down to the railway in Sandon.

Near Cody, on the Noble Five, development is going forward; in the Surprise a raise in ore is being carried from the 1100-ft. level toward the old workings 800 ft. above, and No. 8 adit is being driven to cut the Sunset-Trade Dollar vein at 500 ft. in on the Sunset Silver-Lead & Zinc Mines Co.'s group. In the Slocan Lake district, on Four-Mile creek, there is a fine showing of shipping ore in two drift faces on the Standard, 4 to 5 ft. of solid galena with fahlerz containing considerable silver; one vein has widened to 30 ft., mostly of concentrating ore, containing silver-lead and zinc in quartz. Both the Van Roi and Hewitt-Lorna Doone groups, in the same camp, are also looking well. About 100 men are regularly employed on the Van Roi, which has milled approximately 26,000 tons of ore during eight months ended May 31. Some 1200 tons of silver-zinc concentrate accumulated during last winter is being shipped to Oklahoma; silver-lead concentrate goes to Trail, British Columbia. A few men are working on the Fisher Maiden, Neepawa, and Ottawa. The Ellis Silver Mining Co. is employing 25 men on the Westmont, on Ten-Mile creek, which is developing satisfactorily.

GOLDFIELD, NEVADA

Goldfield Consolidated Mill Repaired. — Plans for Open-Cut Work.—Combination Fraction.—Florence Goldfield.—Leases Around the District.

Rapid progress has been made in repairing the damaged mill of the Consolidated Mines Co., and before the end of June the plant will again be operating at its former capacity of 860 tons per day. Shipments of high-grade ore will be then suspended. The output for June will approximately equal that of May, and the expense columns of the next monthly report will contain an item for construction completely wiping out the fire loss. All of the shafts are to be equipped with electrically driven hoisting machinery. The original Laguna shaft, which is being sunk by the Consolidated to the 700-ft. level, has progressed over 100 ft., and for a considerable distance has been in vein matter the greater part of which has been sent to the mill for treatment. This shaft will greatly facilitate the development of the Red Top at depth. Owing to the flat dip of the vein it is not likely that the Red Top shaft will be sunk to greater depth than the present 330-ft. level. Plans are now being carried out to mine the entire Combination vein from the lower levels to the surface, creating a gigantic 'glory hole' several hundred feet long. It is designed to mine later the Red Top vein in a similar manner from the 330-ft. level to the surface. The discovery made last month at a point about midway between the Red Top and Mohawk shafts, near the Gold Wedge fraction, is proving to be one

The Florence Mill.

of great importance. The ore was first opened on the 450-ft. level from the Mohawk and will be readily reached by driving from the 600 and 750-ft. levels from the Clermont. Another orebody that promises to be one of the company's best assets is that exposed on the 600-ft. level in the northwest drift from the Clermont and in the Red Top vein, on the Lucky Boy claim. The principal tonnage continues to come from the Mohawk mine, in which a large amount of development has been done and where a large tonnage of high-grade ore has been blocked, though production is confined to the ore of milling grade.

The Combination Fraction Co. is now operating the 20-stamp Nevada Goldfield mill, a mile north of town, and is treating from 75 to 80 tons of ore per day, the average of the product being about $25 per ton. Suit has been filed by the John S. Cook bank against the Nevada Goldfield Reduction Co. to foreclose a mortgage on the plant leased to the Combination Fraction company, the sum involved being $52,844. The mill, which was built by an association of Paris bankers, has a complete laboratory equipment and a sampler capable of handling 300 tons of ore per day. The orebody opened on the 50-ft. level of the Fraction is being developed on two other horizons with a highly encouraging showing on the 750-ft. level. It is in the main Mohawk vein and distinct from that first exposed on the 285-ft. level, and now being developed on the 300-ft. level.

The Florence Goldfield maintains a daily production of 150 tons, chiefly from the southern workings in the territory formerly embraced in the Little-Florence and Rogers leases. The main drift to the north on the seventh or 350-ft. level has reached a point below the workings of the bonanza Reilly lease and this territory, undeveloped below a depth of 260 ft., promises to supply a large tonnage of rich ore. Many leases are being operated throughout the district, some making frequent shipments. On the Atlanta, seven leases are working at depths varying from 250 to 730 ft. The best showing is at the latter depth on the Precious Metals Co. lease on the Black Bear claim. Three lessees are working on the Diamondfield Black Butte and two of these are saving ore of shipping grade. From the original St. Ives workings of the Merger Mines company the Ford lease is sending out high-grade ore and a shipment assaying $200 per ton was sent out recently from a lease on the Kendall. The Lind lease on the Booth has exposed pay-ore which apparently extends to the Goldfield Oro ground. The Weber-McLaughlin lease on the south end of the Booth is sinking another lift and will drive to the Red Top vein for the ore-shoot, the apex of which is thought to have been cut on the 150-ft. level. The Annex shaft, on the Polverde claim of the Jumbo Extension, is being sunk from the 800 to the 1100-ft. level, the ore having pinched at the former depth. The Codd Mines Co.'s lease shaft on the St. Ives claim will be sunk from the 550 to a depth of 1200 ft. or more. A 52-hp. electric-hoist has been installed on this ground and a contract let for further sinking. Lessees operating on the Goldfield Daisy have been making occasional small shipments and some good ore is being taken from the Goldfield Belmont. Driving is in progress from the Grizzly Bear shaft on the Consolidated in quest of the Mohawk vein. The Nevada Eagle, three miles west of town, has exposed ore of shipping grade.

TORONTO, CANADA

Cobalt Output. — Dividends Increase. — Gowganda and Porcupine Wait for Transportation. — High-Grader Convicted. — Lead Output Increases.—Mining Law Changes in Quebec.

The output of Cobalt mines for the first five months of 1910 shows a slight decline in tonnage as compared with last year's production during the same period, the figures being respectively 11,995 and 12,064 tons, but the value is considerably greater, owing to the larger proportion shipped in the form of concentrate. Whereas in the earlier part of last season only six concentrators were in operation, the number has now increased to thirteen, and several others will probably be installed before the end of the year. Among the companies which contemplate the erection of concentrating mills are the Crown Reserve and Hudson Bay, and others have contracted for the treatment of their milling ore by the Northern Customs concentrator. The five months' showing is therefore regarded as a satisfactory one. Three mines which appeared on the shipping list of last year have so far been unrepresented this season—Silver Queen, Nancy Helen, and Nova Scotia—but there are about ten new shippers, most of whose consignments, however, have been of an intermittent character. Several of the companies have declared extra dividends. The Nipissing, in addition to the regular quarterly 5% dividend and 2½% bonus, is giving an extra interim dividend of 5%. The McKinley-Darragh has declared the usual 3% quarterly dividend supplemented for the first time by a 2% bonus. The Buffalo adds to its regular 3% dividend an extra 5%. These tangible evidences of prosperity, while they have slightly increased the prices of the stocks affected, have had no effect whatever on the general market, which continues depressed, the long anticipated upward movement having even disappeared from the broker's advertisements. An important find has been made on the portion of the Nipissing property known as R. L. 406, being a rich 3-in. vein in Keewatin formation. This part of the ground has hitherto been considered of little value, and the discovery gives encouragement as to the possibilities of the remainder of the property. The La Rose is meeting with success in the trenching of the Fisher-Eplett location, having struck one good vein showing silver content for 250 ft. in addition to a number of promising stringers. The British American

mine has resumed operations having erected an 8 stamp power plant. Five shafts have been opened and a contract let to sink the main shaft to a depth of 200 ft. The Beaver shaft is being put down to the 200 ft. level and ore is being stoped at the 200 ft. level. A car of high grade ore shipped last month, will net the company about $4,000. A vein was recently discovered in extending at the Ophir from 6 to 12 in. wide of sulphide containing native silver. A winze started on a vein in the north crosscut will be put down to the 300 ft. level. At the Provincial mine now being operated by a syndicate, a high grade vein which had dipped from the shaft has been recovered in driving at a depth of 100 ft. It shows a width of over 3 in. and will average upward of 2000 oz. per ton.

The lack of transportation facilities is considerably retarding operations at Cowganda rendering it unprofitable to ship ore of as low a grade as 100 oz. per ton. Consequently several of the companies are making no attempt at shipment but are accumulating ore on the dumps to await the time when either transportation is improved or cheap power for concentration can be obtained. Among the mines which are taking out high grade ore and will shortly make further shipments are the Millerett, the Reeves Dobie, and the Ponsall. The Morrison property, where some wide and rich veins are in evidence, is under option to an English syndicate which will soon begin operations. In the Porcupine gold camp the same difficulty as regards transportation prevails, and it is found impossible to get in heavy freight except during the winter. Consequently some of the smaller companies have been obliged to suspend operations. Development on the more important claims is making good progress. The Timmons Brothers are putting in a test plant of 15 tons capacity to treat ore taken out in development work by amalgamation and cyaniding. The Hollinger plant is in operation with a force of 90 men. Assays of $347 per ton have been obtained from ore extracted at the 100 ft. level. The Miller company has extracted ore from the big vein assaying as high as $238 per ton. The camp has been visited by many prospective buyers and capitalists interested in mining, but the tendency of holders of undeveloped claims to ask prices which are considered exorbitant deters many investors from buying.

A recent act of the Canadian Parliament makes it possible to convict and punish the frequent offence of high grading, by making it punishable to be found in possession of ore without being able satisfactorily to account for it. The first conviction under this provision was made about two weeks ago, when a foreigner arrested at New Liskeard, near Cobalt, with 14 pounds of ore from the Nova Scotia mine in his possession was given a term of six months imprisonment. An increase in the output of Canadian lead mines is indicated by the returns of the amount paid in bounties for lead ore delivered at Canadian smelters during the fiscal year ended March 31. The bounties at the rate of $15 per ton amounted to $340,542, representing 45,467,545 lb. of lead ore, as compared with $307,432 on 42,533,287 for the previous year. The reported finds of bituminous coal along the Metagami river in northern Ontario have been investigated by W. J. Bauldry, an expert engaged by the Temiskaming & Northern Ontario Railway Commission. He reports that no coal has been found, and that although lignite occurs, the known quantity is not large, and its value altogether problematical. There are, he states, large deposits of iron ore in the district which will yield 50% iron. Some important amendments have been made in the mining laws of Quebec province. The ownership of deposits of building stone, clay, peat, ochre, sand, and some non-metallic substances hitherto retained by the Crown in granting patents is vested in the owner of the surface. Money paid for mining licenses, which were practically leases, at one dollar per year per acre will be allowed on the purchase money when mining lands are bought. The time allowed between the date of staking a claim and the taking out of a mining license is extended from four to six months. The law exempting mines and plants from local taxation has been changed so as to exempt only the mine and the underground plant, the surface plant, mills, and buildings being made taxable.

ALPINE, TEXAS

Activity on Rio Grande Border. Lasca — Chisos — Dalberg Llano District. Quitman Mountains

There is more mining activity in the districts of the upper Rio Grande border region at this time than ever before. Since however the Texas mining law restricts rather than encourages the prospecting and exploitation of claims staked upon public land, practically all of the work now being carried on is upon private lands. An unusual number of prospecting parties are now in the mountains west and south of Alpine and encouraging reports have reached here of promising mineral discoveries in different localities. Regular shipments of copper sulphides are being made from the Little Lightning copper mine, situated near Lasca, a station on the Southern Pacific railroad west of Alpine. This mine is owned by John Gilcrease who is at Lasca giving his personal attention to the development of the property. A syndicate of Tovah, Texas, men are developing a gold claim on Gomez peak, in the Davis mountains, eight miles southwest of Kent. The shaft is now down about 80 ft., and is said to be in ore all the way. Rich gold float

A Bit of the Desert.

has been found in that section of the Davis mountains from time to time. The Chisos Mining Co., of which Howard E. Perry, of Chicago, is the chief stockholder, is making important improvements to its Chisos quicksilver mine in the Terlingua district. It will soon have installed an electric hoist, an elevator for loading the ore, and an ice plant for the benefit of the camp. This company has been doing a profitable business ever since the mine was opened several years ago. Its furnace is in steady operation and regular shipments of flasks of quicksilver are made. The Texas Mica Co., which owns a mica mine near Dalberg station on the Southern Pacific railroad, is installing a large amount of machinery preparatory to inaugurating extensive development. The company owns two sections of land upon which the mica is found, and it is claimed that a large output is available. The Texas turquois mine, owned by A. D. Hudson and situated in El Paso county, continues to produce turquois of excellent quality. Mr. Hudson utilizes the output in his lapidary at El Paso. Joheph Lister, an experienced prospector, recently located claims in the Guadalupe mountains, north of Van Horn station on the Texas & Pacific railroad. He had a number of specimens of gold and silver ore assayed and with good results. The re-

cent revival of mineral development work in the Llano district is attracting the interest of mining men. It is reported that the shaft in the gold-silver mine, 12 miles south of Llano, owned by F. M. Ramsey, of Lampasas, Texas, and associates, is in good ore and that the prospect is favorable for shipments. It is planned to sink this shaft to a depth of 700 ft. It is already down more than 200 ft. The mining of rare minerals at Barrenger Hill, near Kingsland, has been going on successfully for several years. It is said to be one of the most wonderful storehouses of rare minerals in this country. Regular shipments are made to different parts of the country where the minerals are put to various uses. The Sierra Blanca Mining Co., which is developing mines in the Quitman mountains near Sierra Blanca, will build a wagon-road from the railroad station of Ettelyne to its mines, a distance of four miles. This company has uncovered large bodies of copper ore containing gold and silver. The Lulu B group of mines, owned by T. V. McKinney and William Crosby, situated in the Quitman mountains, are being developed into good producers of high-grade carbonate of lead ores. It is reported that regular shipments from the Tama mine to the smelter at El Paso will soon be started. This mine is also situated in the Quitman mountains.

SALT LAKE, UTAH

Lead Production Increasing.—State Inspector of Mines. — Dividends. — Utah Copper Production. — Bingham & Garfield Railway.—Wall Mill.—Daly-Judge.—Zinc Shipments.

Statistics for the year 1909 show that Utah ranks third in the production of lead, following Missouri and Idaho. Utah and Missouri show an increase over 1908, while Idaho shows a decrease. The output of Idaho is about 30,000 tons more than that of Utah, but has been declining during the past several years, while Utah's increase from 1908 to 1909 was over 20,000 tons. At this rate Utah will pass Idaho and take second place within the next two years. The matter of a State inspector for the metal mines is being agitated, with the prospect that a bill to that effect will be pushed in the next legislature. The proposition is to appoint an official who will have jurisdiction over both the metal and coal mines, the latter being the only ones that are under State supervision at present.

For the first six months of the current year various Utah companies have declared dividends to the amount of $4,382,552, as against $7,103,642 for the entire year 1909. Silver King Coalition has passed its second quarterly dividend and Utah Con. has not paid any so far this year. With the completion of several costly improvements at the Silver King, and the operation of the new smelter contract for the Utah Con., these companies should return to the dividend-paying class before the close of the year, which from present indications will be far better than last. Utah Copper heads the list with a total of over $2,300,000 for the first six months. The production of the Utah Copper Co. for the month of May was slightly in excess of 8,500,000 lb. of copper at a cost of about 8c. per pound. The net profits for the month were $400,000. The production for April was 8,000,000 lb., so the two months almost equal the record for the first quarter, which was 18,511,819 lb. at a cost of 8.43c. The directors of the Bingham & Garfield Railway Co. have authorized the issue of $2,500,000 in 6% gold bonds for the construction of the railroad from the mines at Bingham to the Utah Copper mills at Garfield. The railroad was decided upon because the contract with the Denver & Rio Grande railroad calls for the transportation of a maximum of 6000 tons of ore per day and the mills when remodeled will handle 18,000 tons. As the service under the old contract was far from satisfactory it was decided that the only thing to do was to build the railroad and operate it for the Utah Copper Co. exclusively. The bonds will be exchangeable for Utah Copper stock at $50 per share for three years after July 1, 1910, and the company can call them in at any interest day after three years by paying 110 and accrued interest. The Bingham Copper Co., which has passed through many financial troubles, has been practically reorganized and the announcement is made that it has been financed so that the development necessary to put it on a producing basis can be carried on. A new cross-cut from the main tunnel which was started last month has progressed at the rate of four feet per shift, and is now in low-grade ore, the first of three beds that are known to lie in that direction. W. D. Bohm, manager of the North Utah, has taken charge of the Bingham Copper Co. The Wall mill property of E. A. Wall, has been remodeled and will be started up on the ores of the Starless. The mill is unique, being equipped almost entirely with machinery of Mr. Wall's design. The ore is crushed in rolls in which the one roll is above the other, and is treated in washers instead of the usual tables and vanners. The Utah Apex is shipping 175 tons of ore per day to its mill and is producing about 45 tons of concentrate which will run 42% lead, 10 oz. silver, and 10% copper. While it is generally supposed that the company has a considerable amount of copper ore in its territory, no attempt is being made to develop it under present conditions, especially as it has prospects of becoming a really great lead mine. Stockholders of the Ohio Copper Co. are somewhat worried over the rumor that they may be called upon to give the company some financial assistance in order that the equipping of the mill at Lark may be completed. It hardly seems that such a move should be necessary. Although the tryout of the mill showed that there were some changes necessary, it has done good work and has made money while only running at one-half the ultimate capacity.

The Daly-Judge has been working a Starrett air-lift pump on the lower levels for some time and as it has proved successful, it is believed that it will be used to unwater the mine to the 1600-ft. level where operations were checked some years ago by a great inrush of water. The conditions on that level have been the cause for much speculation for some years, and development in that direction will be watched with interest. Work has been commenced on the Bonneville tunnel southeast of Provo, which will be driven by the Jesse Knight interests to prospect the mountains between Provo and Springville for mineral and water. The boiler plant at the Chief Consolidated at Tintic was damaged by fire, the roof being burned off. This gave rise to a report that the hoisting works had been burned. The damage was slight and caused only an hour and a half delay. The last two cars the company shipped netted $10,000. Ore of good quality is now being opened on the 1400-ft. level. The annual meeting of the Columbus Consolidated showed a slight contest for the management, but the old office holders won. Duncan MacVichie was elected a director, and while a great deal of the stock is held in Michigan, no Michigan man was elected to the board, although such has been the custom in the past. A raise has penetrated high-grade ore, so fine as to resemble a concentrate. The location of the raise was such that a great deal of the ore got into the water and was pumped out. The raise has been bulkheaded and another driven from which the ore is to be caught by driving. The Cedar Talisman has received returns on a carload of zinc shipped to Oklahoma which assayed 45% and netted $2335 after all expenses were paid. A second car assaying 44% has been shipped. The Moscow earned $13,000 during the month of May and wiped out the last of its indebtedness. A dividend of 50c. per share has been declared by the American Zinc Co., whose books show:

	1909.	1908.
Net earnings	$360,378	$85,145
Administration and general expense	58,583	20,452
Interest	57,351	47,265
Miscellaneous gains and losses	.....	15,364
Total deductions	115,934	83,081
Net profits	$244,444	$2,064

Three men were killed and fifteen overcome with gas by the explosion of a box of powder on the 1900-ft. level of the Opex mine on the morning of June 25. Two of the dead were killed outright and one by falling down a chute. At the last report all the others had been removed from the mine, but six are still unconscious. All of the men were Austrians.

BUTTE, MONTANA

North Butte — Anaconda Output — Elm Orlu — Conrey Placer — Butte & Superior — Tuolumne — Original — Davis Daly.

The dividend of the North Butte company, even though cut to 4%, seems to give an assurance to the holders of the stock that the management has great hopes for the future. Development is active and it is stated that the work on the 2000 and 2200 ft. levels of the veins of the Edith May and Jessie is showing excellent results. All the mines of the Anaconda company and by this statement all the properties of the Amalgamated company are included, are working up to their full capacity with the exception of the Pat Tor which has been down for several months and the Rarus. The output for June is expected to be fully up to that of May.

The report filed with the county assessor by the Elm Orlu Mining Co. shows that the net proceeds for the year were $20,164 which is considered a good showing. The Elm Orlu, a Clark property, is yet in its infancy as a zinc producer. The reports show that the number of tons extracted were 55,996, with a yield per ton of $10.34. The gross proceeds were $579,438 and the total expenditures $559,274. The cost of extraction was $4.25 per ton, transportation per ton, $2.54, reduction $2.50 per ton, and construction expenses, $34,085. The Conrey placer, at the mouth of the famous Alder gulch, is said to be paying its owners big dividends. There are two dredges at work and in the course of the next three months a third, the largest in the world, will be started. One of the principal owners in this property is Harvard University and it is said that in the past three years the university has received in the vicinity of $1,000,000 from the property. The demand for Butte & Superior stock does not seem to have improved under the terms announced for the re-organization. At the present time the stock is going down, due to Duluth holders throwing it on the market. The circular letter sent out to the stockholders calling a meeting at Duluth for July 9, to consider the re-organization plans, gives in detail the scheme proposed and which has already been outlined. The plans as proposed by the directors meet with general favor in this city, where the mine is known to possess much valuable ore. The Washoe Copper Co. became the property of the Anaconda company under the terms of the merger on March 31, according to the deed filed with the clerk and recorder in this city. The document was executed in New York on May 31, and it is stated that the deed became effective on March 31.

Holders of Tuolumne stock were disappointed when it was decided to pass the expected dividend. The report of the secretary-treasurer showed a cash balance on May 31, of $308,146 as compared with $91,403 one year ago. The net proceeds of the company for the year were $112,619. There were 19,484 tons of ore extracted during the year with a value of $19.75 per ton and a total gross yield of $384,622. It was thought better to wait for a time before declaring a dividend as the price of copper is low and development can be carried on to advantage so that when the copper market advances there will be plenty of ore to treat and dividends can be declared and made permanent. The report states that considerable money has been expended in ascertaining just where the company stands with reference to the disputed ground, with the result that it has been clearly established that the veins claimed belong to the Tuolumne. Whether the North Butte management is satisfied as to the truth of this statement is not known, but it is known that up to a few weeks ago engineers of the Anaconda company were frequently in the Tuolumne mine examining the ground being worked and taking measurements.

The Original group of mines, formerly owned by the Clark interests, but on June 1 transferred to the Anaconda Copper Mining Co., at a price said to be in the vicinity of $12,000,000, shows net proceeds of $181,359 according to the report made to the county assessor for the year. There were 226,492 tons of ore extracted and the gross yield per ton was $8.10. The cost of reduction was $688,492. There was paid for transportation, $48,763; for labor, $547,751, and supplies, $368,219. The total gross yield was $1,834,585. The $1 assessment ordered by the Davis-Daly company will realize $600,000, while the mining expert who was sent out here in the interests of Boston people declares that it will take $1,000,000 to put the mine in good shape. However, it is announced by the management that with the money received from the assessment it is hoped to proceed with development, to construct transportation facilities and to realize on the ore reserves without being forced to borrow. Just how matters will work out is problematical. The Colorado mine has been shut down for some months and the owners have the question of the transportation facilities tied up in the Supreme Court. Should the decision of the court be favorable, the construction of a spur from the mine to the Great Northern railway track can proceed, but should the decision be unfavorable the Davis Daly management will have to resort to some other means than the construction of the spur to get the ore to the Basin smelter, as the property owners along the proposed spur line are very determined and it is a question if the expenditure of a very large sum of money would induce them to relinquish their opposition.

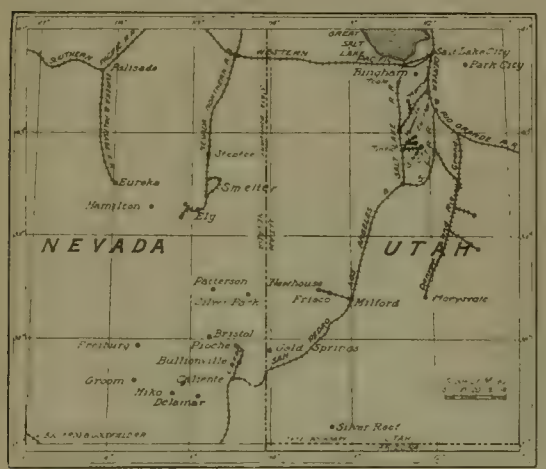
ELY, NEVADA

Steptoe Smelter Changes.—New Sampler. — Blackhorse Bonded. —Cortez Dump Sold.—Boston Ely to Drill.—Giroux Busy.

In efficiency of construction, and in ability to concentrate the ores, the Steptoe Valley S. & M. Co. mill holds a unique position. Unlike most new plants which fall far short in actual operation of the capacity claimed for them, the Steptoe is now treating double the amount of ore claimed for it when the plans were originally drawn. It was expected when the plans were drawn that each unit would handle an average of 1000 tons per day, but they are now actually handling more than double that amount. This is due to a variety of causes. First, the buildings were double decked with concentrating tables, and, second, other capacities were increased, and it was also found that the ore concentrated much better than originally expected. While the concentrators are operating under ideal conditions, the smelting end of the plant has had difficulties to contend with, as the ores carry an excess of silica. This could be largely overcome by direct smelting ores, but unfortunately the Nevada Con. has not developed any. The ores from the Alpha shaft of the Giroux company would relieve the situation if shipped to the smelter. But these, it is unofficially announced, will be shipped to the International at Tooele, Utah, commencing some time during the fall or winter months. Two sets of Allis-Chalmers Style A high-grade rolls have recently been installed in the crushing department at the Steptoe plant. The rolls are placed underneath the coarse crusher and reduce the 3-in. product of the crusher to a size of 1½ in. In connection with the new rolls, a second inclined belt-conveyor has been put in which assists the one already in use to deliver the crushed product to the elevator supplying the mill bins. George F. Waddell, superintendent of the Steptoe concentrator of which the crushing plant forms a part, estimates that the new conveyor will increase the capacity of the crushing plant from 15 to 20%. The new rolls will have no direct influence on the capacity but will materially lighten the work on the rolls inside the mill of which there are three sets, one each of coarse, medium, and fine, to each of the eight sections. The concentrator is at present handling from 8000 to 9000 tons of ore per day. Concentrate is being put into storage in considerable quantities as the four reverberatory furnaces at present in operation cannot handle the output of the mill. Furnace No. 4 must soon be shut down for re-lining which will take about ten days and will put the smelter still further behind. It is believed that the Steptoe company must soon give orders for the completion of the fifth furnace, work on which was suspended early last winter after the furnace was more than half completed. The company is installing an 8-in. pipe-line about 8000 ft. in length in order to conduct the waters of Berry creek to the company's main reservoir on Duck creek, about six miles from the smelter. In spite of Nevada's reputation as a desert country, the smelter company has never lacked water. The present season, however, is unusually dry and

the management is making every effort to conserve the flow of Duck creek and its tributaries in order to insure a sufficient supply of water to last during the hot months of July and August when evaporation is at its greatest and the mountain streams are correspondingly low. A sampler for the testing of the mill tailing is being erected on the hillside west of the concentrator. Tailing from the mill has heretofore been carried off to the valley by three different sets of launders. As soon as the new plant is completed, all the tailing will be directed into one channel and be accurately sampled. Recovery at the Steptoe mill is from 71 to 76%, and the building of the new sampler is the first step in an attempt toward improvement.

The Blackhorse group, owned by Tommy Watkins, has been bonded to Salt Lake and Denver capitalists. Fabulously rich ore, some of it running as high as $100,000 per ton, was found on the Blackhorse mine four and a half years ago, and this naturally created much excitement and a rush. Thomas O'Neill, of Ely, secured a bond on the Blackhorse mine, paying down $10,000. Later he spent a considerable amount in development, but allowed his payments to lapse, and the property passed back to the original



Eastern Nevada and Western Utah.

locator, who has since been treating the ore in an arrastre with good results. The present bond was secured on the property by R. Courtright, of Blackhorse, and A. G. Burrett, of Salt Lake, who will at once put a force of men on development. They announce their intention to put a milling plant on the property within the present year. The Nevada Amalgamated Mining Company, owning the San Pedro group in the same district, is now engaged in the erection of a 10-stamp mill at San Pedro, about two miles from the mines. The work of construction has been delayed somewhat by the difficulty of securing heavy timbers, but they have at last arrived and the plant is being crowded to completion. The mill will also treat custom ores. S. F. Snyder, a mining engineer, has just returned to Ely from a visit to the old Cortez district in Eureka county, in which the new and live camp of Buckhorn is situated. The Cortez mine in former days produced $19,000. Its tailing dump has been sold for $30,000, and will be treated by the cyanide process. The Buckhorn mines are owned by George Wingfield, of Goldfield, and are being opened up for extensive production. Representatives of the United States S. R. & M. Co. are examining the property, with a view to purchase, it is said, for $3,000,000. It is further stated that if the smelting company secures the property, it will build a railroad from the Southern Pacific to the new camp. The Boston-Ely contemplates prospecting its ground from the 1227-ft. level with core-drills. The work above that level demonstrates a large area of leached material, containing copper carbonate, suggesting that an enriched zone will be found at greater depth. The Giroux Consolidated Co. is rushing the equipment of its 5-compartment shaft, which is said to be the largest in the State. The sump on the 1200-ft. level has been cemented and the pumping station is being completed. When this is done, one 1200 and two 600-gal. pumps will be installed, after which a cross-cut will be driven 700 ft. back under the old Alpha workings, where large bodies of high-grade, direct-smelting ores have been blocked. When this has been done it is expected the company will commence shipping to the new International smelter, and it is also expected that at that time the company will start its 500-ton concentrating plant, which has been idle for the past two years.

NEW YORK

Market Conditions. — Copper. — Porcupine. — Heinze and his Troubles.—San Cayetano.—Ray Central.—Greene-Cananea.

This has been 'old home' week for New York. Mr. Roosevelt returned amid a din of plaudits. Five or six days later another sojourner abroad came up New York bay, Mr. J. P. Morgan. He is home from several months spent in London, Paris, and in Italy, and is expected to restore the exhausted courage of the bulls. The semi-panicky hysterical condition of mind following the recent move of the Federal authorities against the Western railroads has worn off, but on the other hand there has been no return of that confidence which begets absorption, or even that which induces speculation. The convertible bonds of the various copper companies have already made for themselves a place among investors solely because of profit possibilities through conversion into stock, and unquestionably the dividend payers such as Goldfield Con., Nipissing, Kerr Lake, and others, are coming into greater favor through the pressure of higher cost of living which is compelling small investors of capital to seek larger returns. Amalgamated's 2% dividend, which cannot be increased, is compared disparagingly with the recent extra distributions made by Nipissing, and with the 60% paid by the Crown Reserve, and with the income derived from Camp Bird, Esperanza, El Oro Mining & Railway, and Mexico Mines of El Oro. Goldfield Con. has been accepted by the listing committee of the New York Stock Exchange.

The copper situation remains unchanged. The necessity for organization is becoming more apparent. Copper dividends are beginning to suffer somewhat. North Butte reduced its quarterly distribution to 30c. per share as against 50c. paid quarterly during the past year or more. North Butte's neighbor, Tuolumne, failed to meet expectations and, instead of declaring a dividend, voted to retain its surplus of over $300,000 in the treasury. The directors are evidently fortifying themselves against any possible break in the metal which might compel them to place part or all of their output in storage for a few months rather than sell in a market demoralized by desperate competition. Recently the abnormal and increasing production has been recognized as the critical point in the copper metal market and the consensus of opinion now is that consumption cannot be expected to overtake the present increasing output. The increase in surplus of 36,000,000 lb. in two months is sufficient to cause the consumer to buy only when purchases can no longer be postponed. Plans to add other large producers to the list are not being sidetracked and this is an additional feature which will compel the formation of a copper trust. Miami, Ray Con., and Ray Central are building mills. Chino is to be an open-cast property and steam-shovels are to be stripping the overburden as soon as they can be placed in operation, probably within 30 days. Drill work is claimed to have developed 18,000,000 tons of ore; the additional output from these mines will certainly force some radical action for the protection of the metal market. The South Utah Mines & Smelters Co., a re-organization of the Newhouse Mines & Smelters Co., has made a contract with the International S. & R. Co. for the handling of its ores and production from the South Utah will begin as soon as the new smelter at Tooele is prepared to handle the output. Application has been made to list the shares of the Shattuck-Arizona on the Boston Stock Exchange. In connection with the application it appears that the property is producing in round numbers 2,000,000 lb. of copper per month at a cost of 5½c. The Shattuck-Arizona adjoins the

Copper Queen and the Calumet & Arizona at Bisbee and in addition to the distinction of producing what is probably the cheapest copper in the United States at the present time, also holds a unique record in that it has paid its board from the beginning of operations. There has been expended in development some $1,500,000 but of this amount the shareholders have contributed but $10,000 the balance having all been derived from the operation of the mine. At the present time the company is shipping about 100 tons of ore daily to the Copper Queen smelter and is earning $10,000 to $15,000 per month on the output, the ore running between 17 and 18% copper. There is some talk of opposition to the merging of the Mines Company of America, Dolores, and El Rayo, but it is not taken seriously.

The Porcupine situation remains unsettled. 'Spotty and uncertain' seems to be the verdict up to the present moment. Surface showings are admittedly wonderful, but those who have had previous experience with gold finds in Ontario are going very slowly. A recent visitor to the district says: 'The country is muskeg from end to the other. There are no roads, so there is great difficulty in getting about. Considerable interest regarding the district was aroused by the finding of rich surface ores, and this was recently stimulated by the shipment of a carload of what was stated to have been an average of the ore from the Timmins shaft, which gave a return of $202.75 per ton. In my opinion, the excitement is unwarranted. The showings are not so phenomenal as we had been led to believe. The district is filled with men who are mostly unfamiliar with mining of any kind, much less gold mining. There is practically no one at all in the camp who has ever had any previous experience with gold mining with the result that the reports of finding free gold on the surface has been much over-rated. The carload that was shipped from the Timmins shaft was taken from three places, the major part coming from No. 2 shaft, which is now closed. It is stated that they have 15 or 16 veins on that property. The probabilities are that the workings in depth will prove unremunerative, the deepest shaft at the present time being about 70 ft. On the Wilson property, which is controlled by the Monell Nickel people, five shafts are being sunk 100 ft. deep, and it is proposed to connect them at that depth in order to prove the property. There is a phenomenal gold showing on the surface in places and the property is under option at a large price. There is a considerable amount of work going on in the camp but it seems to me that the expenditure of capital for development in most cases is entirely unwarranted by the surface showing. Prices asked are inordinately high, the experience of Cobalt being taken as a precedent despite the fact that conditions are entirely different." While this is admittedly based on a short visit it comes from a well known and competent engineer.

Miami Looking Southeast, April, 1910. Pinal Mountains in the Background.

It is beginning to appear that, in spite of all the jauntiness of F. Augustus Heinze during his recent grapple with the Federal authorities, his defence has cost him something of a pretty penny. Almost all his companies are in difficulties. The complete financing of Ohio Copper has been announced several times, but Mr. Heinze has just departed for Europe with the avowed purpose of placing some Ohio Copper bonds while abroad. Amsterdam interests hold considerable United Copper and are expected to help put some value in United by helping Ohio, a controlling interest in Ohio being one of the chief assets of United. If the Dutch bankers refuse to subscribe for Ohio bonds the stockholders may expect to get an Irish dividend. The holders of Davis Daly have again been required to come to their own rescue by meeting an assessment of $1 per share. Silver King Coalition is badly involved in litigation and all in all therefore Mr. Heinze came forth from the court room only to confront a sea of troubles, for once not altogether of his own making.

The operations of the San Cayetano at Guanajuato are to be broadened and the company is to be an even more important factor in the camp than heretofore indicated. The recent increase in the capital stock of the company from $250,000 to $1,500,000, par $5, was evidently in preparation for increased activity as a holding and development company. The first step in this direction has just been consummated by the acquirement on the part of the San Cayetano Mines Co. of a large territory lying immediately to the north of the San Cayetano tunnel, the group of claims including La Joya, the San Juan de la Montana, El Puertecito, the Pabellon, the San Francisco de la Fortuna, and the Santa Virginia. Included in the deal was the completion of the title of the Meximora, in which the Guanajuato Reduction & Mines Co. has, up to the present time, had an undivided interest, the property having for a long time been included in the San Cayetano ground, under a leasing arrangement which is now discontinued and the title completed in the San Cayetano company. The newly acquired territory outside of the Meximora, which is one of the famous mines of the camp, is ground adjacent to the San Cayetano and from the work in the San Julian crosscut of the San Cayetano is expected to prove of much value to the company. Adolph Lewisohn is in Europe, and in his absence his associates refused to discuss the future plans for the San Cayetano, though it is certain that the property is to be developed into one of the most important producers of the camp. There is a rumor of a merger of two of the Lewisohn properties in Arizona, or rather an absorption of one by the other. The New Keystone may be taken over by the Miami on the basis of five shares of New Keystone for one share of Miami.

The Ray Central Copper Co. is placing orders for the first unit of its mill. The equipment now planned is in the nature of an experimental mill of 1000 tons daily capacity, which if successful is to serve as the first unit of a larger mill to be immediately erected. The total of developed and probable ores of the Ray Central are now estimated at 15,000,000 tons. The management of the property is in the hands of J. Parke Channing. An analysis of the annual report of the Greene Consolidated Copper Co. reveals the fact that Mr. Greene carried his picturesqueness into his financial operations most consistently. He became a copper magnate on copper that cost him 17c. per pound to produce and even at that he insisted upon taking the best of the ore out of the ground. His Sierra Madre Land & Lumber Co., a 51% interest in which was carried on the Greene Consolidated Co. books at par $7,650,000, represented an outlay of only $650,000. The entire amount of this item has, under the new regime, been charged off and in addition some $4,205,966 has been spent in betterment and replacements the entire plant having been overhauled and largely rebuilt. Beside the amount mentioned, such work as could be legitimately charged to copper cost has been so charged, though it might more properly have gone to construction account.

The new Bureau of Mines will start out on July 1 with appropriations aggregating at least half a million dollars. The total amount granted in the Sundry Civil bill is $488,000. The principal item is $310,000 for the investigation of the causes of mine disasters and the establishment of nine additional so-called rescue stations.

General Mining News

ARIZONA

COCHISE COUNTY

The Wolverine & Arizona Copper Co., at Bisbee, is shipping about 250 tons of ore per month which is reported to be the richest now being handled in the district.——The Great Western Copper Co., at Courtland, has received the churn-drill that was shipped recently and will commence prospecting at once.——The shaft on the Leadville claim at Paradise is now over 140 ft. deep, the vein in the bottom being 20 in. wide. It is the intention of the company to continue sinking to the 220-ft. level and commence stoping ore for shipment. An average value of the ore, which consists of lead, silver, and zinc, is about $62 per ton.——The drift at the Commanche Chief is in 100 ft., having followed the vein for 80 ft. of that distance.——The shaft of the Red Mountain Development Co. passed through 15 ft. of ore at a depth of 100 ft. that assayed $10 per ton.

GILA COUNTY

(Special Correspondence).—The west winze sunk from the fourth level of the Gardner workings at the Superior & Boston mine is 127 ft. deep, and has been continuously in ore averaging 8% copper on the Black Oxide vein.——The cross-cut driven southward on the 500-ft. level of the Telfair shaft at the Arizona-Michigan property is 1000 ft. long and less than 100 ft. more of driving should open the Old Dominion vein. The formation in the face consists chiefly of shale, stained with hematite.——The total advance made in 30 drifts and raises at the Miami property during the week ending June 18, was 1000 ft. Exploration and blocking out of a tip of the orebody running west on the St. Johns claim has developed 440,000 tons of ore, which has not previously been included in the company's estimates.——The large hoist to be installed at A shaft by the Old Dominion company arrived at the mine June 23.——Drill hole No. 8 on the Live Oak property is 255 ft. deep and still in granite capping.——Beginning July 1, the Warrior Development will send its ore, amounting to 100 tons per day, to the Old Dominion smelter instead of to the El Paso smelter, as in the past.——The Summit Copper Co. is employing a force of 14 men on the 15 claims recently acquired from the Gibson Copper Co. J. P. Hamilton is on the ground making plans for a concentrator to begin treatment of disseminated ore, 100,000 tons of which, having an average copper content of about 3%, is contained in the dump.

Globe, June 28.

MARICOPA COUNTY.

The adit at the Tellurium group, 60 miles northeast of Mesa, has opened the vein when in 180 ft. exposing ore of the same grade that was cut on the surface which assayed $35 per ton.

MOHAVE COUNTY

E. H. Barton, manager for the Frisco Mines & Power Co., operating the Gold Crown group of mines in the Union Pass district, returned from New York several days ago and announced the purchase of a 100-ton mill to be erected at once. The machinery, weighing about 200 tons, is being furnished by the Chalmers-Williams company, and part of it is on the way. Pachuca agitators and Burt revolving filters will be used.——The Desert Power & Water Co. is to add a 1200-hp. Nordberg engine to the Kingman plant, doubling its capacity.——Two Chilean mills are to be added to the Gold Road mill to slime the pulp. This is expected to raise the capacity of the plant to 300 tons per day. In the mine air-shaft No. 2 has reached a depth of 300 ft.; the raise started from the 500-ft. level to connect with this is up 75 ft., leaving only 125 ft. to drive. This shaft will not only enable freer stoping of the 500 ore-shoot, but will be used to handle timbers, steel, and other materials.——The Tom Reed has just finished a new transformer house and is installing another 5 by 22-ft. tube-mill, which will greatly increase its output.——The Cyclopic mine, in the Gold Basin district, has been bonded by a group of New York men and development by sinking will be started at once. The Cyclopic is a deposit of low-grade ore, which is generally regarded as a blanket deposit, and has yielded considerable in a small amalgamating mill. The lowest workings at a depth of 40 ft. show good ore, and the new operators propose sinking a deep shaft.

PINAL COUNTY

The Ray Consolidated Copper Co. is now only operating nine churn-drills, the main effort of the company being devoted to the installation of equipment. At the main shaft preparations are being made to install the hoist, compressor plant, and rock breaker, all of which will be operated by electricity generated at Hayden, where the mill and smelter are being built.——The controlling interest in the Sultana Arizona Copper Co. has been purchased by the Baldwin syndicate of Chicago and the name changed to the Kelvin-Sultana. Over 3000 ft. of underground work has been done, a good body of copper ore opened, and it is now proposed to install a concentrating mill.

YAVAPAI COUNTY

After a test run of several days at the Monte Carlo mill the plant has been shut down for lack of water and sinking resumed. The clean-up resulted in a $500 bar.——At the Octave mine the ore is being drawn entirely from the Joker shaft and the 20-stamp mill is kept in operation night and day. Considerable gold is caught on the plates and a high-grade concentrate shipped.——The mill of the Mildred Gold Mining Co. is nearly completed and will be started in a short time.——At the Yarnell mine T. J. Sparks has cut a station at the mill level and will commence lateral work toward the ore.——The Federal Mining Co., operating on Cherry creek, has purchased a 6-hp. gasoline engine from the Arizona Mine Supply Co., and will install it at the property.——A good body of red oxide copper ore has been struck on the 700-ft. drift in the Haynes property near Jerome. Thomas E. Campbell, the manager, states that he will install an electrical pumping plant within two weeks.——Work has been resumed at the Hull and Cleopatra properties, after a delay of a few days caused by a defective engine.——The orebody is being developed on the United Verde Extension property and the ore piled on the dump.

CALIFORNIA

INYO COUNTY

Asa B. Hall has secured a bond on the Union mine which is one of the oldest locations in the county. The ore is from 12 to 40 ft. wide, the pay-shoot being valued at about $8 per ton for its lead-silver-gold content. Considerable high-grade ore was taken from the property in early days and shipped to the smelters, the vein being opened to a depth of 200 ft. There is now over 1000 tons of milling ore on the dump from previous operations.——The Casa Diablo shipped a $3000 gold bar a few days ago. The mine is now paying all expenses and is expected to become a dividend payer in a short time.——The Keane Wonder, at Skidoo, shipped the regular monthly clean-up for May which amounted to a little less than $20,000.

KERN COUNTY

(Special Correspondence).—Through the agency of C. Grant Illingworth a deal has been closed for the sale of the Cora Dee mine, which is adjacent to the Gold Stone in the Stringer district. The mine was owned by W. Greenwood and has now become the property of the Atolia Mining Co. The Cora Dee has a well developed lode of scheelite averaging from 5 to 10% of tungsten. The sale price is between $3000 and $4000.——The Pearl Wedge, owned by C. G. Illingworth, has ore sacked and ready for the mill which is expected to yield about $3500.——Spurlock and partners on the Merced sent 24 tons to the mill this week, realizing $2400.——The Sunshine Leasing Co. has 100 tons ready for cyaniding which will net from $3 to $7 per ton.——The Halford brothers have taken a lease on the Minnesota group, owned by Gunderson brothers, who have uncovered a vein of low-grade ore, over 3 ft. wide, on the Golden Link, one of the Josephine group.——Watchman brothers, working on the 70-ft. level on the Butte, have run

into a rich vein in the bottom which had been overlooked by the previous lessees. It assays about $200 per ton. —The Mabey Lease on the Gold Queen in the Stringer district has struck a promising vein in the 70-ft. shaft. Christenson & Dotson are working in beds of gravel from the washes of old channels in the Stringer district. These contain both gold and tungsten in paying quantities. The Stanford Mining & Reduction Co. of Johannesburg has made several mill runs of this gravel and has found that the extraction in gold and tungsten runs from $10 to $15 per ton, principally gold. —Pat Byrne and Clyde Kuffel have sunk a 40-ft. shaft in the gravels on the Gold Coin and have struck a bed of gravel 8 ft. deep which is rich in gold and tungsten. —On the Fuller claim in the same neighborhood a 40-ft. shaft and a 70-ft. drift have been driven, from which a large quantity of pay gravel also containing gold and tungsten has been taken. —Diedrick, Peterson & McClure, on the Lucky Star, Bremmer group, in the Stringer district adjoining the Santa Ana, have come on a very rich lead of ore, at a depth of 80 ft. which will run about $800 per ton, and are developing the vein. — Thirty feet of good water has been found 600 ft. below the surface in a shaft on the Little Butte.

Randsburg, June 25.

NEVADA COUNTY

The work of re-opening the Blue Lead drift mine at Relief is progressing steadily, operations having again been started in the bedrock adit. The raise that was recently completed did not open the channel, as the bedrock pitched sharply to the north, but the next one is expected to cut the bottom of the channel.— The contractors have completed the hauling of the lumber from Nevada City to the Tarr Mining Co.'s ditch and are now freighting in the machinery that will be installed at the gravel claims.— The grading for the installation of the new machinery at the Fruitvale mine near Moores flat has been completed and the compressor will be set up in a few days. Andrew Fitzgerald is superintendent.——The new 10-stamp mill at the Birchville is running steadily and 60 men are working at the property.——Work has been resumed at the old Cincinnati Hill mine southwest of Grass Valley under supervision of A. D. Foote. A 4-in. air line from the Massachusetts to the Cincinnati is under construction and as soon as the prospect shaft which has been started to cut the vein is in ore development will be rushed.——The Empire Mines Co. is to build a cyanide annex and will install two Oliver filters.——The installation of the new hoisting plant at the Montana mine in Willow valley has been completed. W. G. Drown is manager.

SHASTA COUNTY

It is reported that the railroad to the Afterthought mine at Ingot will be completed, and work resumed at the property, which has been idle for over two years. S. E. Bretherton is consulting engineer.

SIERRA COUNTY

A 2½-ft. vein containing free gold with considerable arsenical sulphide has been cut by the adit at the Afterthought mine in the Alleghany district. The property is situated on Kanaka creek and is owned by John Carroll and John Allen.——The drift at the Caesar is now in 300 ft. on the vein, which is from 30 to 36 in. wide.——When in 350 ft. the adit at the Sierra Wunder opened seven feet of ore, samples of which panned well.

TUOLUMNE COUNTY

(Special Correspondence).—Preparations have been commenced for extensive development work at the Jumper mine. The shaft will be straightened, the hoist moved to the footwall side, and the 40-stamp mill thoroughly overhauled. It is probable that a steel head-frame will also be erected.—— Ore ranging from $75 to $100 per ton is being taken from the Tiger mine, near Saw Mill flat. The strike was made 20 ft. below surface. ——The crew at the Eagle-Shawmut has been considerably increased and 40 of the 100 stamps are again dropping. It is understood that the entire plant will be in operation before long.——The adit being driven to tap the vein at the Experimental Gulch mine is in 630 ft., leaving about 170 ft. of ore-vein to drift on. —Work has been resumed at the Reservation mine in the vicinity of Columbia. —Work is being rushed on the Mud Springs mine, the principal development being on the 1000-ft. level where driving and stoping are in progress. —The Keller group of six mines also known as the Hazel Dell group, situated near the Knits has been bonded to the Columbia Reduction Co. of Kansas, and underground work will be commenced immediately. —The 4-stamp mill on the property will be overhauled and put in readiness to commence crushing ore whenever needed. —The McLarnahan-Stinchfield and Rosedale gravel claims in the Mormon Creek district have been bonded to a company and it is reported that work on a large scale will be commenced at once.

Tuolumne, June 25.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence).—A rich discovery was made this week at the holdings of the Bard Creek Mining & Milling Co., operating on Lincoln mountain. In running the southeast drift on the Nelsen vein a streak of ore 8 in. wide was cut that assays from 1000 to 2000 oz. silver and from 4 to 7 oz. gold per ton. F. Nelson is manager. Rendhal & Wilcox, leasing on the Hercules level of the Seven Thirty mine on Sherman mountain, have opened a streak of smelting ore that is from 7 to 12 in. wide. The

Central City, Colorado.

first shipment of six tons brought a settlement of 475 oz. in silver per ton and 15% in lead.——It is reported that a deal has been closed whereby Eastern capitalists secure possession of the Becker placer. The sale is said to involve a cash consideration of $100,000.——A carload of ore was shipped last week from the Donaldson mine, on Donaldson mountain, that brought a settlement of 1.92 oz. gold and 3.58 oz. silver per ton. The smelting streak is said to be from two to three feet wide, while the shoot has been proved for 135 ft. Fred Nye is manager.——The Cumberland mine was the scene last week of an important discovery, a streak of ore from 10 to 14 in. wide having been cut that is worth from $400 to $450 per ton.

Georgetown, June 25.

GILPIN COUNTY

(Special Correspondence).—A new shaft-house is being constructed at the British mine in Lake gulch. Within a few days a force of men will be at work in sinking the shaft, now down 220 ft., to a depth of 320 ft. S. A. Rank has been appointed manager.——The new 10-stamp mill of the Gilpin-Eureka Mining Co. was started up last week, the capacity being 40 tons per day. J. N. Caldwell, of Denver, is manager.——The Perigo mill was started this week and will treat ores from the Perigo, War Eagle, and Comstock mines.——The Boneta mill, at Idaho Springs, has been leased by the Gilpin American Mining Co., and is being overhauled. When started it will be fed upon ore from the Victor mine, situated at the head of Virginia canyon.—— J. H. Nankervis, of Idaho Springs, has taken a bond and lease upon the Delmonico property on Quartz hill. The main shaft, down to a depth of 1300 ft., is being unwatered. ——An air-compressor plant has just been placed in po-

sition at the Clarissa mine in Virginia canyon. The property is owned by Philip Mixwell of Idaho Springs.

Central City, June 25.

LAKE COUNTY

The adit at the Siwatch group, on Sugar Loaf mountain, is progressing at the rate of 200 ft. per month, the face now being a distance of 1200 ft. from the portal. It is expected that the mineralized zone will be opened within the next 800 ft.——Hoisting has been suspended at the Castle View shaft while portions of the timbers are changed and the guides lined.——The Emmet mine, which is leased by the Small Hopes Mining Co. to Frank Zaitz, is shipping low-grade copper-lead ore regularly.——A new electric hoist has been installed at the Continental by Fred J. McNair who has a lease on the ground and connections made with the power company's wires.

SAN JUAN COUNTY

At the Gold Nugget mine, near Silverton, which was taken under lease last May by J. T. Janes, several shoots have been opened that assay over $30 per ton, and a body of ore 300 ft. long and assaying about $12 per ton has been stripped on the surface. The latter will be cyanided. The Nugget is situated in Maggie gulch and is surrounded by a number of active producers.——Conditions at the Frank Hough mine are better than at any time since the mine resumed operations. The outside bins contain 800 tons and the chutes in the mine contain over 200 more, all of which is said to be of excellent shipping grade. A station has been cut on the 400-ft. level and a winze is being sunk on the ore which contains a high percentage of bornite.

TELLER COUNTY

F. L. Shaw who recently obtained a lease on a block of ground in the Hiawatha claim in the Cripple Creek district has opened the shoot at a depth of 75 ft. and is shipping two carloads to test its value.——The debts of the company operating the Agnes claim on Beacon hill have been settled and work will be resumed on the property.——Grading has been started at the new shaft of the El Paso Consolidated on the north end of the property and a powerful hoist will be installed. Miners are sinking from the surface and raising from the fourth level, and it is planned to have the shaft in operating order by the time the workings are drained by the Roosevelt tunnel.——The new headframe at the shaft of the Midget mine has been completed.——The lessees on the Ajax mine have opened a shoot of high-grade ore on the 400-ft. level 1200 ft. north of the main shaft. Some of the ore has assayed as high as $300 per ton.——The Carol Mining Co., which has been stoping about 400 tons per month from the Monument mine has stopped mining temporarily to retimber the shaft from the 700-ft. level.——The plant at the Cresson, which was destroyed by fire last April, has been replaced and mining resumed with a force of 125 men.——The Mitchell lease on the Pinnacle has opened a shoot of $90 ore at a depth of 350 ft.——The raise on the Knife Blade vein in the American Eagles mine is opening a seam that has widened out to several inches of 6-oz. ore.

IDAHO

BLAINE COUNTY

(Special Correspondence).—The dump of 20,000 tons of tailing at the North Star mine, on the east fork of the Wood river, is to be milled by Allen & Hanson, of Utah, on a royalty basis. The dump contains a good grade of silver, lead, and zinc ore. The lessees are to pay a royalty of 25%. John Williams, of Hailey, who is interested in the North Star, states that in the mine there is a 16-ft. body of silver-lead-zinc ore, and that a one-car shipment made some time ago ran 45% zinc.——The Wolf Tone mine, situated on Deer creek, is being further developed by the Eclipse Mining Co., and is in charge of H. E. Pomeroy. Former development was at the surface, and to obtain greater depth a cross-cut is being driven from Wolf Tone creek. It has been advanced 1700 ft., and work is to be continued till the principal contact vein between limestone and quartzite is tapped, which will be at about 700-ft. depth.

Hailey, June 24.

SHOSHONE COUNTY

The Monarch Mining Co. has sold a two-thirds interest in the Monarch mine near Murray, to the Coeur d'Alene North Fork Mining & Smelting Co. for $175,000. The company also has a lease to work the remaining one-third interest and an option to buy it. Seventy-five thousand dollars has been paid in cash and a mortgage for $100,000 given on the two-thirds interest. The lease provides that the new company shall work the property as a whole and issue to the Monarch company $499,900 of its paid up and non-assessable stock and $100 capital stock to a person to be named by the selling company. After the note for $100,000 is paid the new company shall pay one-third of its net earnings to the Monarch company.——W. M. Walker and J. Leicht, of Spokane, have taken an option for $30,000 on the Emma group of eight lode claims which is situated in Gold Run gulch, three-quarters of a mile from the town of Murray, and is one of the best known gold properties in the camp. In an early day it was a producer of much rich ore, but lack of transportation facilities discouraged the owners and little has been done since then. Work has been started in a new adit in which some good ore is exposed.

MISSOURI

JASPER COUNTY

A good discovery of galena ore has been made at a depth of 14 ft. on the Lone Pine ground northeast of Knight's station.——The shaft at the Hallowe'en has been unwatered and development started on the orebody. The shaft is down 180 ft. The derricks at the new mill in Stotts City have been completed and the inclines started.——The Vinegar Hill Mining Co., of Joplin, has leased the Julia West ground and is preparing to prospect it.——The Keystone mine has been started again after a few days' stop on account of the heavy rains.——H. L. Kramer, who has a lease on the Marion Staples land, is to erect a mill and develop the property. The pump in the shaft which is at the 150-ft. level has been started, and drifts will be run in the ore which is largely calamine and rosin jack.——J. A. Waterhouse has installed an 80-hp. boiler on the Clark land and is unwatering the shaft which is reported to have opened zinc ore from the depth of 190 to 225 ft. A number of drills on adjoining land are said to have cut ore at about the same depth.

NEVADA

HUMBOLDT COUNTY

(Special Correspondence).—The double-compartment shaft of the International Metal Mining Co. is being rapidly unwatered. The Old Pride of the Mountain vein has been proved to a depth of 135 ft.——The new mill of the National Mining Co. has arrived at the camp. It is of the Lane Chillean type with a capacity of 40 tons per day. The mill will treat the low-grade ore from the mines.——The Laurel company is shipping its first consignment of ore.——Sixty men are on the payroll at Jarbidge, nearly double the number employed last month.——The first lease north of the Pavlak shaft has opened three feet of ore assaying $16 to $44 per ton. A small seam of high-grade quartz has also been uncovered.——The Free Gold company has commenced operations with two shifts.——The Tacoma company is driving an adit and sinking a shaft on its holdings.——Butte interests have acquired a group of claims near the main properties.——At the Pick & Shovel work is progressing in two shafts and an adit. The main shaft is down 50 ft.——The Rye Patch Consolidated is driving on three feet of ore said to average $100 per ton. The ore contains silver and lead. D. W. Jeffs is manager.

Winnemucca, June 24.

LYON COUNTY

The Bluestone Extension Mines Co., which owns 180 acres just north of the Bluestone mine, has installed a new hoist and will sink the shaft, now down 65 ft., to the 500-ft. point, cross-cutting to the vein every 200 ft. There is a large amount of 3% copper ore blocked out in the Bluestone, and the Extension operators believe that they have the same contact that developed the ore in the older prop-

ore.— Jules Lajoie, who is in charge of the construction of the new smelter at Wabuska for the Mason Valley Mines Co., is authority for the statement that the plans for the smelter were nearly complete and that contracts for the grading would be let in a short time. Grading for the spur track from Wabuska to the smelter site is to be started at once and will be completed by the end of July.— There are 15 men working at the Nevada Douglas and plans are being prepared for the installation of an automatic distributor which will convey the ore to the bins. A three ton skip is also being installed in the incline shaft.— The Yerington Gold Co., which owns the group south of the Nevada Douglas is to install a hoist and commence sinking. Operations are to be resumed at the Honest Endeavor. The company will complete the cross-cut to the ore that was started at the 150-ft. level.

NYE COUNTY

(Special Correspondence.)— The south drift from the 700-ft. point of the Montgomery Shoshone shaft has opened an ore-body, but development has been suspended owing to the strong flow of water which forced the miners out. A diamond-drill has been installed at the top of the winze and is prospecting the ground, which is all virgin territory.— The Pioneer lease is sending to the Mayflower mill 50 to 60 tons of ore per day which averages about $30 per ton, and is principally from the dumps. Besides this, from 50 to 100 tons per week of high grade is shipped to smelters.— The Chambers lease on Original Bullfrog has recently made several small shipments of high-grade ore to Goldfield. On the adit level about 15 ft. of gold-silver ore is exposed.—The Vulcovich lease on Tramp Consolidated has opened a narrow seam of rich ore.— The Eclipse company recently sent out two bars of bullion valued at $7000, the result of a 10 days' run of the mill.— The Bullfrog-Mohawk has installed a duplex pump, electrically operated, and will commence active development.——The Montgomery Mountain is planning to resume operations as soon as the assessments on the old stock come in. Stock in the new company will be given for the old stock, when the 3c. assessment accompanies the old certificates.

Rhyolite, June 17.

Though the recent decision of Judge Stevens at Goldfield, regarding the apex rights of the Round Mountain Mining Co., was unfavorable to that company, the management is planning to install new machinery and increase the output to over 200 tons per day. The case is to be appealed. The Round Mountain Water & Power Co. has secured leases from the Round Mountain Mining and the Round Mountain Daisy companies on the pipe-line and will continue its placer operations.——Hoisting and shipping of ore was resumed last week at the MacNamara at Tonopah after a temporary suspension, and 130 tons of ore was forwarded to the smelter. There is a good showing underground and the management expects to ship regularly.——On June 18 the Montana-Tonopah shipped the regular semi-monthly lot of bullion and cyanide precipitate. Operations are being advanced on every level between the intermediate above the 390 and the 765-ft. levels, and enough ore is in sight to crowd the capacity of the 40-stamp mill for some time to come.

STOREY COUNTY

The water in the C. & C. shaft at Virginia City has been lowered about 250 ft. below the 2350-ft. level and the timbers are found to be in good condition though there is much débris in the workings.——Last week 23 cars which averaged $12.18 were taken from the southwest drift from the east cross-cut on the 2400-ft. level of the Ophir. The drift is entirely in vein matter and is exploring ground that has never been prospected before. The northeast drift on this level is now out about 50 ft. the face showing seams of quartz.——The west cross-cut on the 1700-ft. level of the Consolidated Virginia run from a point 51 ft. up the raise has been stopped and a south cross-cut started which is now in ore that assays from $6 to $7 per ton. The ore broken in the stopes on the 1800-ft. level assays from $9 to $10 per ton.——At the Ward shaft the west drift on the 2000-ft. level is now out over 40 ft. from the shaft and on the 2400-ft. level the installation of pumps No. 3 and 4 has been completed.

WHITE PINE COUNTY

(Special Correspondence.)— The breach of water on the lower level of the steam-shovel pit of the Nevada Consolidated a short time ago which engulfed one steam shovel did not prove as serious as was at first apprehended. The water has since practically disappeared, but there is no doubt that the water level has been reached, and it will be impossible to take another slice from the bottom of the pit without providing for pumps to relieve the probable inflow of water. The sulphide ores extend for a depth of 150 ft. beneath the present floor of the pit. Two steam shovels are now working on ore on the second level of the pit and loading about 6500 tons of ore per shift. The frame work has been completed at the concentrating plant of the Steptoe reduction works of the Nevada Consolidated for a testing plant of the tailing, where a number of experiments will be tried. The company has been saving only from 71 to 72% of the value of the ores treated in its concentrator, hence it has been suffering a heavy loss, which it hopes to largely avoid in the future.— The sump at the 1200-ft. level of the Giroux shaft of the Giroux company has been cemented and the cementing of the pumping station has been commenced. The station is 21 by 105 by 15 ft., and will be equipped with one 1200 and two 600-gal. pumps.——A pumping plant will be erected at once on the Brilliant shaft of the Ely Consolidated and after the mine has been unwatered the vein will be picked up on the 500 and 625-ft. levels, and further development undertaken. The company also contemplated the installation of a pumping plant on its Zack shaft, which is flooded with water to the 400-ft. level. This property has been extensively developed above the water-level and shows extensive bodies of carbonate and sulphide ores which will be developed at greater depth.

Ely, June 24.

UTAH

BEAVER COUNTY

Joseph V. Coyle has opened an 18-in. vein on his claims, six miles southeast of Minersville, that assays from $3 to $50 per ton.——The Commonwealth Mining Co. is opening ore that assays 200 oz. silver per ton.

JUAB COUNTY

The repairs to the pump on the 1600-ft. level of the Gemini have been completed. The Ridge & Valley mine, which is operating through the Gemini, is stoping on the 1500 and 1600-ft. levels and both properties are forwarding heavy shipments.——The motor which was ordered some time ago for the Yankee Consolidated should arrive at the mine any day and will be set in position at once. All the other machinery is now in place and the buildings have been completed.——The shaft at the Eagle & Blue Bell has been retimbered to the 200-ft. level and sinking resumed. At the same time a raise was started from the 1000-ft. level to meet the shaft.——The Victoria shaft, which is down 550 ft., is being retimbered where necessary and will be sunk to the 1000-ft. level.——Iron Blossom is stoping in the No. 1 and 3 workings and will commence driving on the 1700-ft. level in the early part of this month.——The shaft at the Colorado is down 500 ft., and the station and sump are being cut at that level.——The drift which was driven into the Governor ground from the Star workings, is expected to open the ore in a short distance.——It is reported that the King William is to resume work shortly.

SUMMIT COUNTY

At a recent meeting of the board of directors of the Scott Hill Mining Co. an assessment of one-quarter of a cent per share was levied, and it was decided to continue work in the face of the adit which is now in 140 ft. It is thought that the contact will be opened in the next 50 ft.——About a dozen men have been employed at the Little Bell for the past few weeks preparing for the installation of new machinery. Underground the mine is said to be in excellent condition, several large bodies of milling ore having been opened in addition to the high-grade.——By the middle of the month the management of the Daly-Judge expects to

have the new electrical equipment in the concentrating plant at Park City all installed. The transmission line leading from the mine to the mill is being strung and the power will be furnished by the Snake Creek Power Company.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—A second shipper was added to the Nelson list during the past week when the Athabasca mine, on the hill behind Nelson, sent 26 tons of select ore to the Trail smelter.——A gold bar was brought to Nelson during the week from both the Nugget and Queen mines, Sheep creek.——The Canadian Collieries Co. has been organized to operate the Extension and Comox collieries, and increased production of coal is promised.——In Portland Canal district, the most important work is that of the Portland Canal Mining Co., which has erected an aerial tramway 8500 ft. in length, with 2100 ft. difference in altitude between terminals; it is also equipping a 75-ton unit of its concentrating mill, and preparing to install a 6-drill air-compressor.——There is a prospect of the Hidden Creek Copper Co.'s mine, on Observatory Inlet, being again worked shortly. This has been developed by an adit to a depth of 500 ft., and above this level there is more than 300,000 tons of ore blocked out. Steps are being taken to put in a 500-ton smelter.

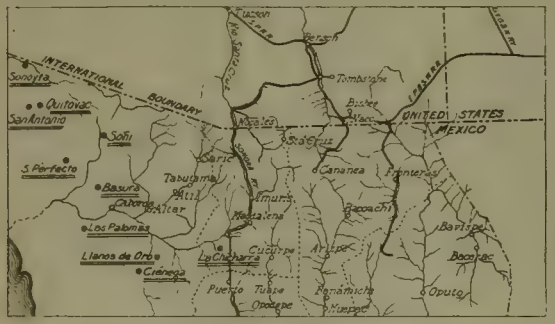
ONTARIO

The drift on the 225-ft. level of the Little Nipissing, on Peterson lake, has opened a 14-in. vein that contains a high percentage of native silver and smaltite. The lease on the property, which is held by the Peterson Lake Mining Co., has been extended five years giving the company eight years to operate the mine.——The drift on the 200-ft. level of the Crown Reserve is in the conglomerate again and is being driven to intersect the leads cut by the diamond-drill in the prospecting. The Victoria vein which was opened in May is proving one of the best leads found in the Cobalt district, some of the assays having run as high as 6000 oz. silver per ton, and will soon be opened enough to be the main reserve of the company.

MEXICO

CHIHUAHUA

The directors of the Rio Plata Mining Co. declared the regular 2% quarterly dividend payable to stockholders of



Northern Portion of Sonora.

record June 20. Over 200 tons of tailing was treated at the mine in May and 57,136 oz. of silver recovered. Seventy bars of silver valued at $500 each were shipped from the mine early in June.

SONORA

A company of English capitalists has been organized under the name of the Tomminil Mining Co. to take over the Rosario and adjacent claims in the Altar district. The mines are antiguas and have good production records.——The Mina Juarez, situated near Caborca, has cleaned up the mill and hung up the stamps till more ore can be blocked out by the underground work.——The Marguitos Mine Co. has opened a 7-ft. vein in the San Cortez property that assays about 40 oz. silver per ton. There is a large amount of ore in the mine that assays from 12 to 15% lead with 16 oz. silver per ton.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

FRAUDULENT ENTRY ON COAL LANDS

By a fraudulent entry on coal lands a claimant acquired no rights therein, and his alleged title is void. Neither could he acquire any title to a coal mine thereon pending cancelation of such fraudulent entry, and his obtaining an injunction on the strength of his supposed right before cancelation of his entry was said to be a fraud on the jurisdiction of the court.

Baldwin Star Coal Co. *v.* Quinn, (Colo.) 105 Pac. 1101, Dec. '09.

MINING PARTNERSHIP—AUTHORITY OF PARTNERS

Where the members of a mining partnership were not able to agree, it was held that those having the majority interest had the right to control the management in all things necessary and proper for the operation of the mine, and they could not be held liable in an accounting except for culpable negligence, breach of duty, wrongful conduct, or diversion of the property from the business of the firm. And in an action for dissolution, accounting, and winding up of the mining partnership, an inferior court was not authorized to enter a personal decree against one partner in favor of another for the balance found due him on incomplete settlement. The social property should first be reduced to money and the proceeds applied to the discharge of the partnership liabilities, including any balance found due on final settlement from one partner to another, and then a decree over on final settlement for any balance that might remain. And in such a settlement one partner who had paid the share or interest of another in the operating expenses would be entitled to interest thereon, as against the delinquent partner, on dissolution and final settlement and winding up of the partnership.

Bartlett & Stancliff *v.* Boyles, (W. Va.) 66 Southeast. 474, Nov. '09.

DOWER IN MINING PROPERTY

Coal in place is said to be 'real estate' within the meaning of a statute giving a wife dower in all her husband's real estate, of which he was seised in fee simple at any time during the coverture.

Reynolds *v.* Whitecarver, (W. Va.) 66 Southeast. 518, Dec. '09.

INJURY TO MINER—FELLOW SERVANT

The owner and operator of a mine cannot be held liable for the mistake or incompetency of the certified foreman required by the statute of Pennsylvania, where the statute invests such foreman with power to compel compliance with his directions, so far as they relate to the safety of employees. And the Supreme Court of Pennsylvania has just decided that a mine foreman is a fellow-servant with the other mine employees of the same employer engaged in a common business, and the employer is not liable for injury due to the negligence of such foreman. But it is not clear whether the court referred to the negligence of the foreman required by the statute called a "certified foreman," or an ordinary foreman employed by the operator of the mine.

Golden *v.* Mt. Jessup Coal Co., (Pa.) 73 Atl. 1103, June '09.

DEVISE OF COAL LANDS

A testator by his will devised to one person the surface of certain lands described, and gave to another the coal under such lands. On a construction of the will in a controversy between the devisee of the lands and the devisee of the coal, it was held that the will gave to the former the land in fee simple, except the coal under it, and that it gave to the latter the coal, with the right to mine it, including the necessary roadway and the use of the surface necessary to the proper operation of the mine.

Myher *v.* Myher, (Mo.) 123 Southwest. 806, Dec. '09

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

HOWARD D. SMITH is in London.

C. K. LEITH has returned from Cuba.

MAX DUNCHANDEL is in San Francisco.

CHARLES MACNEIL has gone to Europe.

C. S. HERZIG is expected in San Francisco.

DAN O'BRIEN, of Columbia, is in San Francisco.

FRANCIS DRAKE has gone to southern California.

W. F. FARNHAM, of Chucksan, Korea, is in San Francisco.

FRITZ WOLF has gone to Amador county on professional business.

A. H. HOWE went to New York to assist in welcoming Mr. Roosevelt.

J. E. SPURR was in San Francisco on his way from Tacoma to Tonopah.

LOUIS J. MAYBURY has returned to Collahuasi, Chile, from Caranguas, Bolivia.

H. KILBURN SCOTT has sailed for British East Africa on professional business.

THOMAS D. MURPHY is manager of the El Favor mine at Hostotipaquillo, Mexico.

READ E. MILLER is examining, with a view to purchase, a lead property near Clyde, Idaho.

C. H. GORDON and L. C. GLENN have been appointed Associate State Geologists of Tennessee.

O. T. SCHINDLECKER, of the Oriental Con. M. Co., in Korea, is spending his vacation in California.

RUSH M. HESS has accepted a position with the Real del Monte y Pachuca, at Pachuca, Mexico.

NORMAN C. STINES has gone to Siberia to assist J. POWER HUTCHINS in an examination of placer fields.

GUY M. VAIL, of Portland, Oregon, has gone to Fairview, Nevada, to supervise the construction of a mill.

WILLIAM A. FARISH, JR., has been appointed superintendent of the Keane Wonder mine, Death Valley, California.

L. D. RICKETTS has been in a New York hospital as a result of a fall in the mine at Cananea. He is recovering nicely.

J. D. HUBBARD, of the Oriental Con. M. Co., arrived from Korea on the *China* and will spend July and August at Santa Clara.

F. B. WILDER, chemist for the Chino Copper Co., of Santa Rita, New Mexico, has resigned to accept a position at the Copper Queen smelter at Douglas, Arizona.

M. K. RODGERS, of Seattle, Washington, is doing some work on the Dunton, an extension of the Cracker Jack vein, on Prince of Wales Island, Ketchikan district.

C. L. HERRICK has resigned as Western representative of *Mines & Minerals* to accept a position at Lebanon, Ohio. He will be succeeded at Denver by GEORGE F. DUCK.

WALTER O. SNELLING, chief chemist of the explosives section of the Technologic Branch of the United States Geological Survey, left Seattle, Washington, on June 17, for Alaska, to investigate methods of blasting.

A. CUNNINGHAM, a graduate of the school of mines of the University of Washington, Seattle, Washington, is about to leave for Chena, in the Fairbanks country, Alaska, to erect and operate a 'limited custom' 10-stamp mill.

A. W. MORRIS, who for the past two years was in charge of the cyanide plant at the Black Mountain mine, Magdalena, Sonora, will have charge of the new plant of the Zambona Mining Co., at Alamos, Sonora, after July 1.

GEORGE J. YOUNG, of the Mackay School of Mines, at Reno, Nevada, has returned from an eight months' trip, during which he visited numerous schools of mines in the Eastern States, Canada, Germany, France, and Great Britain, seeking information relative to methods and equipment.

Metal Prices

LOCAL METAL PRICES

San Francisco, June 30

Antimony	12–17½c	Quicksilver (flask)	47–47½
Electrolytic Copper	14½–15c	Spelter	7–7½c
Pig Lead	4.70–4.75c	Tin	32½–32¾c

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper.	Lead	Spelter	Silver, per oz.
June 24	12.40	4.34	4.98	58⅝
" 24	12.40	4.34	4.98	58⅝
" 25	12.25	4.34	4.98	58⅝
" 26	Sunday.	No market		
" 27	12.25	4.34	4.98	58⅞
" 28	12.25	4.34	4.98	58⅞
" 29	12.25	4.34	4.98	58⅞

JOPLIN LEAD AND ZINC PRICES

The *News Herald* figures for the week ended June 28, 1910, are as follows.

The high price for zinc blende was $44 per ton and the average on all lots was $39.85 compared with $40.20 of the previous week.

Spelter was steady at $5 which was lower than last week, the closing price then being $5.05.

Calamine ores brought as high as $27 per ton, the average being $22.21. On a 40% basis the price ranged between $20 and $23 per ton.

Lead ore was unchanged at $49 per ton, with an average for all lots of $48.84 compared with $48.75 for the previous week. The pig lead market was unchanged at $4.22½.

Below are given the value of shipments from each district with a summary for the district:

Joplin: Blende, $32,760; calamine, $528; lead, $8624. Total, $41,912.

Webb City-Cartersville: Blende, $73,040; lead, $16,856. Total, $89,896.

Galena: Blende, $8920; lead, $2450. Total, $11,370.

Granby: Blende, $3200; calamine, $200; lead, $315. Total, $3715.

Duenweg: Blende, $21,480; calamine, $594; lead, $4116. Total, $26,190.

Miami: Blende, $7688; lead, $3600. Total, $11,288.

Aurora: Calamine, $2618.

Zincite: Blende, $3608.

Badger: Blende, $3084.

Oronogo: Blende, $10,243; lead, $23. Total, $10,266.

Carthage: Blende, $3770.

Stotts City: Blende, $4160.

Quapaw: Blende, $2457; lead, $912. Total, $3369.

Sarcoxie: Blende, $1080.

Spring City-Spurgeon: Blende, $2120; calamine, $814; lead, $1372. Total, $4306.

Alba-Neck City: Blende, $17,220; lead, $115. Total, $17,335.

Peoria: Calamine, $132.

Summary for the district: Blende, 9,926,290 lb.; calamine, 619,150 lb.; lead, 1,572,930 lb. Values: Blende, $196,827; calamine, $6886; lead, $38,388. Total, $242,101.

Total for 25 weeks: Blende, 254,030,885 lb.; calamine, 20,630,850 lb.; lead, 40,664,070 lb. Values: Blende, $5,338,351; calamine, $257,582; lead, $1,011,651. Total, $6,657,484.

JAMES P. WALLACE, who died at Nogales, Arizona, June 19, was well known throughout the West, having conducted mining operations for thirty years in various States and Territories, especially in Colorado and Mexico. Dr. Wallace was taken ill at Culiacan and died while on his way to his home in Colorado Springs, to which place his body was taken for burial. He was a member of the American Institute of Mining Engineers, the Colorado Scientific Society, and a frequent contributor to the technical press. Probably his best known work is his book 'A Study of Ore Deposits for the Practical Miner', which has been widely read and used.

Market Reports

ANGLO-AMERICAN SHARES.

Cabled from London.

	June 23.	June 29.
	£ s. d.	£ s. d.
Camp Bird	1 8 0	1 7 6
El Oro	1 7 9	1 7 3
Esperanza	2 13 9	2 17 0
Dolores	1 8 9	1 7 6
Oroville Dredging	0 6 6	0 6 6
Mexico Mines	8 10 0	9 5 0
Tomboy	1 0 0	0 17 6 ex div.

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, June 30.		Closing prices June 30.
Adventure	5	Mohawk	46
Allouez	36	North Butte	19¼
Atlantic	5	Old Dominion	32½
Calumet & Arizona	49	Osceola	121
Calumet & Hecla	535	Parrot	13
Centennial	15	Santa Fe	1½
Copper Range	58½	Shannon	9¾
Daly West	7	Superior & Pittsburg	9¾
Franklin	9¾	Tamarack	46
Granby	31	Trinity	5
Greene-Cananea, ctf	6¾	Utah Con	19½
Isle Royale	15⅛	Victoria	3
La Salle	10	Winona	6¼
Mass Copper	7	Wolverine	110

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, June 29.		Closing prices June 29.
Amalgamated Copper	60¼	Miami Copper	18½
A. S. & R. Co.	71¼	Mines Co. of America	9/16
Boston Copper	18⅜	Montgomery-Shoshone	9/16
B. C. Copper Co.	5⅛	Nevada Con	17⅞
Butte Coalition	16½	Nevada Utah	9/16
Chino	10⅝	Nipissing	10⅞
Davis-Daly	1⅛	Ohio Copper	1⅝
Dolores	6¼	Ray Central	2¼
El Rayo	3½	Ray Con	15¾
Ely Central	1	South Utah	1¼
First National	3¼	Superior & Pittsburg	9¾
Giroux	6⅝	Tenn. Copper	22½
Guanajuato Con	1	Trinity	5⅛
Inspiration	7⅜	Tuolumne Copper	2⅜
Kerr Lake	8¼	United Copper	43⅜
La Rose	4¼	Utah Copper	40½
Mason Valley	7⅛	Yukon Gold	4⅛

SOUTHERN NEVADA STOCKS.

San Francisco, June 30.

Atlanta	$ 12	Mayflower	$ 3
Belmont	3.40	Midway	26
Booth	13	Montana Tonopah	98
Columbia Mtn	6	Nevada Hills	1.55
Combination Fraction	51	Pittsburg Silver Peak	70
Daisy	6	Rawhide Coalition	20
Fairview Eagle	30	Rawhide Queen	28
Florence	2.05	Round Mountain	45
Goldfield Con	8.85	Sandstorm	4
Gold Kewenas	6	Silver Pick	8
Great Bend	3	St. Ives	13
Jim Butler	28	Tonopah Extension	80
Jumbo Extension	25	Tonopah of Nevada	8.75
MacNamara	30	West End	52

By courtesy of San Francisco Stock Exchange.

COMSTOCKS.

San Francisco, June 30.

Alpha	$ 6	Julia	$ 10
Alta	10	Justice	10
Andes	13	Kentuck	13
Belcher	70	Mexican	1.05
Bullion	13	New York Con	3
Brunswick Chollar	8	Occidental	25
Brunswick Potosi	7	Ophir	80
Caledonia	48	Overman	90
Cassidy	20	Potosi	40
Challenge Con	17	Savage	19
Chollar	10	Scorpion	8
Confidence	66	Seg. Belcher	21
Con. Imperial	3	Sierra Nevada	25
Con. Virginia	80	Silver Hill	5
Crown Point	70	St Louis	5
Exchequer	20	Union	33
Gould & Curry	14	Utah	5
Hale & Norcross	22	Yellow Jacket	64

(By courtesy of San Francisco Stock Exchange.)

OIL SHARES.

San Francisco, June 30.

Alma	$ 1.00	Palmer	$ 1.35
Apollo	15	Paraffine	95
Associated Oil	45.25	Peerless	5.50
Bay City	2.50	Pinal	7.00
Blue Moon	24	Premier	90
Brookshire	1.97	Record	6.00
California Midway	55.00	Republic	45
Caribou	15.00	Sauer Dough	1.75
Claremont	1.65	Section 25	25.00
De Luxe	1.65	Silver Tip	1.95
Enos	1.45	S. W. & B.	40
Fulton	1.25	Sterling	2.02
Illinois Crude	50	Turner	1.50
Monte Cristo	3.27	Wolverine	30
Nevada Midway	32	W. K. Oil	3.75

(By courtesy of San Francisco Stock Exchange.)

Current Prices for Chemicals

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as specified. For round lots lower prices may be expected, while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min.	Max.
Acid, sulphuric, com'l, 66°, drums, 100 lb.	$0.90	$1.25
Acid, sulphuric, com'l, 66°, carboy, 100 lb.	1.00	1.50
Acid, sulphuric, C.P., 9-lb. bottle, bbl., lb.	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb.	0.09½	0.12
Acid, muriatic, com'l, carboy, 100 lb.	1.70	2.00
Acid, muriatic, C.P., 6-lb. bottle, bbl., lb.	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb.	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb.	5.25	6.50
Acid, nitric, C.P., 7-lb. bottle, bbl., lb.	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb.	0.12½	0.15
Argols, ground, bbl., lb.	0.20	0.25
Borax, cryst. and conc., bags, 100 lb.	2.75	3.85
Borax, powdered, bbl., 100 lb.	3.00	4.00
Borax glass, ground, 30 mesh, kegs, 100 lb.	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb.	4.50	5.50
Bromine, 1-lb. bottle, lb.	0.55	0.65
Candles, adamantine, 12 oz., 40 sets to case.	3.50	4.15
Candles, adamantine, 14 oz., 40 sets to case.	4.00	4.55
Candles, Stearic, 12 oz, 40 sets to case.	4.95	5.50
Candles, Stearic, 14 oz., 40 sets to case.	4.65	5.20
Clay, fire, sack, 100 lb.	1.50	2.00
Cyanide, 98 to 100%, 100-lb. case, lb.	0.20¾	0.24¾
Cyanide, 98 to 100%, 200-lb. case, lb.	0.20	0.24
Cyanide, 125 to 127%, 100-lb. case, lb.	0.27½	0.28½
Cyanide, 125 to 127%, 200-lb. case, lb.	0.26¾	0.27½
Lead acetate, brown, broken casks, 100 lb.	8.75	9.00
Lead acetate, white, broken casks, 100 lb.	10.00	10.25
Lead acetate, white, crystals, 100 lb.	11.75	12.25
Lead, C. P., test., gran., 100 lb.	13.00	15.00
Lead, C.P., sheet, 100 lb.	15.00	18.00
Litharge, C.P., silver free, 100 lb.	10.50	13.00
Litharge, com'l, 100 lb.	6.50	7.50
Manganese ox., blk., dom. in bags, ton.	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton (85% MnO_2—¾% Fe)	45.00	50.00
Mercury, 75-lb. flask	48.00	49.00
Nitre, double ref'd, small cryst., bbl., 100 lb.	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb.	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb.	7.25	8.25
Potassium bicarbonate, cryst., 100 lb.	12.00	15.00
Potassium carbonate, calcined, 100 lb.	15.00	18.00
Potassium permanganate, drum, lb.	0.11	0.12½
Silica, powdered, bags, lb.	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb.	1.50	1.75
Soda, bicarbonate, bbl., 100 lb.	2.00	2.50
Soda, caustic, ground, 98%, bbl., 100 lb.	3.00	3.50
Soda, caustic, solid, 98%, bbl., 100 lb.	2.65	2.85
Zinc dust, 1400-lb. casks, 100 lb.	8.50	9.50
Zinc shavings, 800 fine, bbl., 100 lb.	10.50	11.50
Zinc sheet, No. 9—18 by 84, drum, 100 lb.	9.50	10.50

THE HECLA MINE HOIST

Perhaps no electric hoisting plant has attracted more attention from the mining men of the entire country than that of the Hecla Mining Co. at Burke, Idaho. The American Institute of Mining Engineers during their 1909 tour made the trip to this mine for the express purpose of inspecting the plant. The power available for this plant is 3-phase 60-cycle current ranging from 2080 to 2300 volts. The motor generator, Fig. 1, is self-contained, having a cast iron base, bearings and shaft. A 450-h.p. 3-phase 60-cycle motor drives the direct-current generator which is built commercial operation is secured at all points even when conditions necessitate running at lower than normal speed. All the operating levers have the same direction of throw with a movement of less than 30 inches. They are conveniently grouped upon a raised platform consisting of an iron frame and hardwood floor with a suitable stairway leading from the engine room floor to the platform and a brass hand rail enclosing the stairway and platform. The entire electrical equipment described above was supplied by the Westinghouse Electric & Manufacturing Company.

The hoist, Fig. 2 and 3, which was built by the Wellman-Seaver-Morgan Co., consists of two reels, each capable of

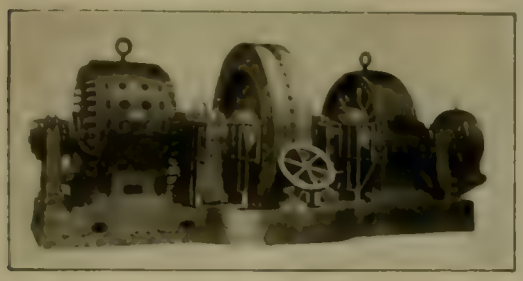


Fig. 1. Motor-Generator Set.

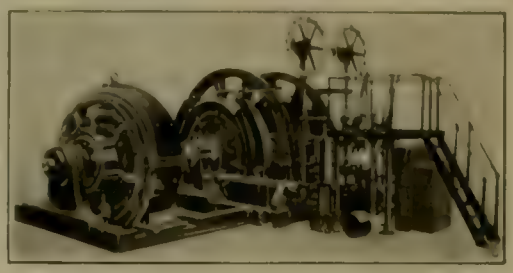


Fig. 2 Hoist Erected in Shop.

Fig. 3. Engine Room Showing Hoist in Place.

equipped with commutating poles to enable it to handle full load current at any voltage between 0 and 600. The flywheel, weighing 30,000 lb., is mounted on the shaft between the motor and generator, while the direct connected exciter is carried upon the shaft extension at the end of the set. The direct-current, 550-hp., 600-volt, hoist motor, operating at 60 rev. per min. (Fig. 2), is direct-connected to the main reel shaft by a flange coupling. The control of the direct-current circuit for operating the hoist is obtained by means of a lever, the forward movement of which starts the hoist in one direction, and the backward movement in the opposite direction. This lever is direct-connected to a reversing field rheostat with a large number of points; since it is used to vary the generator voltage instead of cutting resistance into and out of the hoist-motor armature circuit holding 2500 ft. of $\frac{3}{4}$ by 4 in. flat rope. Under normal conditions the hoist operates balanced; that is, the empty cage descends as the loaded cage is raised. If desired, however, either reel may be operated independently of the other. The winding diameter of the reel varies from a minimum of 5 ft. when empty, to a maximum of 13 when the entire 2500 ft. of rope is wound up. Each of these reels is fitted with a Webster, Camp & Lane band friction clutch, post brake, and indicator. The brakes, which are operated by means of combined air and oil cylinders and heavy counterweights, are so designed that they are set by the weights and released by means of air cylinders. This hoist has a maximum hoisting speed of 2400 ft. per minute, and will handle an unbalanced load of 16,000 lb., including rope, from a depth of 2500 ft., yet its operation is the acme of simplicity.

The complete equipment, including the motor-generator set, hoist motor, slip regulator, switchboard, and hoist, weighs over 300,000 pounds.

The operation of large electric hoists, with mutual satisfaction to the mining company and the power company, has, during the past few years, received careful consideration and today there is no question but that this problem has been satisfactorily solved. With the introduction of the polyphase alternating current generators and high tension transmission lines, electric power has become available in most of the great mining districts. The simplest method of utilizing this power for hoist work is through the direct application of an alternating-current induction motor. If the capacity of the hoist is comparatively small, this is quite satisfactory, but where heavy loads must be handled at high speed, the peak due to acceleration of the moving parts, is often far in excess of the average requirements of the hoist, in which case, if the current is purchased from a power company which also carries a lighting load, the voltage fluctuation at each recurrence of the hoist-cycle peak will prove most objectionable. If the hoist is placed at the end of a long transmission line, an excessive amount of copper must be used to prevent an undue drop in the voltage during the maximum demand. In any case, the power company must install all its equipment with reference to peak instead of the average load and must charge accordingly. To meet these conditions the fly-wheel motor-generator type of hoist has been developed. The essential parts of such a hoist system are:

(A) A shunt-wound direct-current motor, geared or coupled to the hoisting drums.

(B) A fly-wheel motor-generator set consisting of: (a) An alternating-current induction motor with variable external secondary resistance. (b) A direct-current shunt-wound generator with auxiliary commutating poles. (c) A heavy fly-wheel mounted on the motor-generator shaft. (d) A direct-current exciter for separately exciting both generator and hoist motor.

(C) A slip regulator which by varying the secondary resistance of the alternating-current motor causes it to slow down under heavy loads.

(D) A suitable controller for varying and reversing the direct-current generator field current.

The armatures of the direct-current generator and hoist motor are connected in series and the field of each machine is separately excited, constant full field being maintained on the motor. The hoist is started by applying a gradually increasing field to the generator, thus causing a proportionate voltage to be impressed upon the armature of the hoist motor. When the load on the alternating-current motor reaches a pre-determined limit, resistance is automatically cut into its secondary circuit by means of the slip regulator. The speed of the motor-generator is thus reduced and a portion of the stored energy in the fly-wheel utilized in overcoming the peak of the hoisting cycle, with a minimum demand on the power system. In stopping the hoist at the end of a cycle the generator field is gradually weakened so that any excess energy stored in the descending cage, rotating hoist motor, and drums, is returned to the fly-wheel through the direct-current generator which momentarily acts as a motor, receiving electrical energy from the hoist motor, the functions of which are also momentarily reversed. To reverse the hoist, the field of the generator is reversed, causing the motor to rotate in the opposite direction. The heavy peak loads are thus eliminated from the line and the wear on the mechanical brakes is much reduced. Since the current handled by the controller is small, a great many steps can be provided, giving the operator an elastic and sensitive control under all conditions.

JULY DISBURSEMENTS for dividend and interest will total close to $235,000,000. Actual figures show $231,785,000, compared with $215,245,000 in the same month of 1909, $189,866,000 in 1908, and $198,297,000 in 1907. Dividends aggregate, to date, about $87,114,000, against $82,308,000 in 1909, $75,723,000 in 1908, and $83,259,000 in 1907. American Tobacco preferred disburses $1,180,336 and General Electric $1,303,576.

CATALOGUES RECEIVED

The WOOD DRILL WORKS, Paterson, New Jersey. 'Rock Drills'. Illustrated. 30 pages. 6 by 9 inches.

THE TRENTON IRON CO., Trenton, New Jersey. 'Wire Rope and Fittings'. Illustrated. 48 pages. $3\frac{1}{2}$ by $6\frac{1}{4}$ inches.

The NEW YORK ENGINEERING CO., New York. 'The Empire Hand Prospecting Drill'. Illustrated, 22 pages. 6 by 9 inches.

THE AMERICAN WELL WORKS, Aurora, Illinois. Bulletin 115. 'American Air Compressors'. Illustrated. 80 pages. $7\frac{1}{2}$ by $10\frac{1}{2}$ inches.

ORENSTEIN-ARTHUR KOPPEL CO., San Francisco and Los Angeles. 'Koppel Shoes and Dies, Hercules Brand'. Illustrated. 20 pages. $6\frac{1}{4}$ by $8\frac{1}{4}$ inches.

COMMERCIAL PARAGRAPHS

HAFF & COLWELL BROS., Ely, Nevada, have lately issued a large wall map of White Pine county, Nevada.

ALGERNON DEL MAR has established his office at 410 Union Trust Bdg., Los Angeles, and is specializing in stamp-mill and cyanidation consulting work.

The WISCONSIN ENGINE CO., Corliss, Wisconsin, advises that George B. Foster has been appointed Chicago sales manager and that his office will be in the Fisher building.

THE TERRY CORE DRILL CO. advises that the Argentum Mines Co. is installing a Terry core drill for prospecting below the lower levels of its mine on the Foster property in Ontario, Canada.

The C. W. HUNT CO., New York, builders of coal handling, conveying, and hoisting machinery, has opened offices at State Bank building, Richmond, Virginia, and also at 607 Rhodes building, Atlanta, Georgia, with W. F. Lee, for several years preliminary engineer to the company, in supervision.

THE NELSON IRON WORKS, of Nelson, British Columbia, has taken over the business and stock of the Rossland Engineering Works, of Rossland, and will succeed that company as British Columbia agents for the SULLIVAN MACHINERY CO., of Chicago. An increased stock of Sullivan rock-drills, diamond-drills, hammer-drills, air-compressors, and supplies for these machines will be maintained at Nelson.

The ALLIS-CHALMERS CO. has received from the United States Steel Corporation additional orders for six gas engine-driven electrical units which will increase the corporation's power-plant at Gary, Indiana, 25%. The 25 engines which the Allis-Chalmers Co. has installed in this plant, and the order just secured, will make a total of 31 gas engines with a combined capacity of 150,000 hp., making it the largest power-plant of its kind in the world. These units will operate on blast-furnace gas.

SMITH, EMERY & CO. announce that they have secured the services of A. W. Conner, civil engineer, who has for several years been associated with the Illinois Steel Co., at Chicago, and has been for the last two years employed as engineer of erection in the company's new plant at Gary, Indiana. Mr. Conner is thoroughly equipped by experience, and is a graduate of Perdue University. He will have charge, as manager, of Smith, Emery & Company's iron and steel inspection department, covering San Francisco, Los Angeles, Seattle, Pueblo, and Birmingham.

LUCUIS I. WIGHTMAN, for the past six years advertising manager for the Ingersoll-Rand Co., has resigned his position, the resignation taking effect August 1. He will open an office in New York City as an independent specialist in machinery advertising, handling the accounts of manufacturers of machinery and engineering products. Mr. Wightman brings to his new enterprise qualifications peculiarly fitting him for this line of work. His broad acquaintance in the world of trade and technical journalism, his understanding of advertising mediums and methods, and his intimate knowledge of engineering in many phases, will prove invaluable to those whose advertising accounts are placed in his charge.

The Dorr Classifier

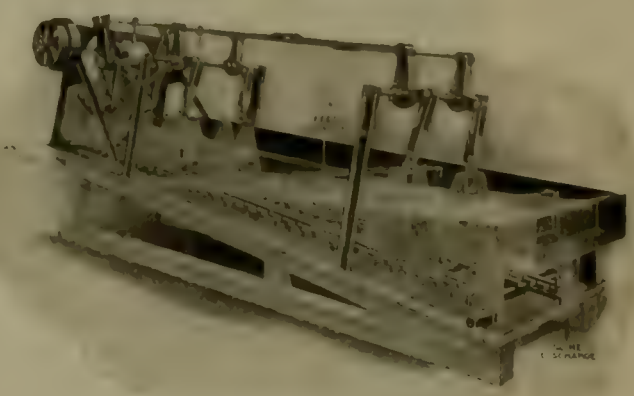
Spells Success Wherever Used

Makes the best separation of sand and slime

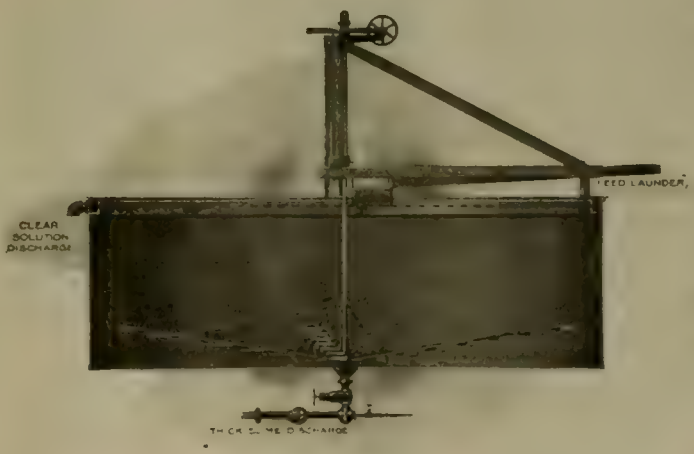
Gives an ideal product for tube milling

1/8 H. P. runs it when handling a hundred tons per day

Repairs nominal



THE DORR CONTINUOUS THICKENER



Gives a continuous clear overflow

Thickened pulp may be drawn intermittently if desired

Power, attendance and repairs negligible

Small loss of mill height

Great capacity. Pulp cannot lie dead

Designed by the inventor of The Dorr Classifier

Among recent orders received has been one for 10 Dorr Classifiers and 8 large Thickeners from the new Santa Gertrudis Company at Pachuca, Mexico.

Full Data on Request

THE DORR CYANIDE MACHINERY CO.

728 EQUITABLE BLDG.
DENVER, COLO.

PROFESSIONAL DIRECTORY.

ENGINEERS, METALLURGISTS, AND GEOLOGISTS.

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UNITED STATES.

ALASKA.

Lanagan, W. H.
Lidstone, E. D.
Patterson, H. W.
Polson, W. L.
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ARIZONA.

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Hopkins & Hurd.
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Merrill, Frederick J. H.
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Parish, S. F.
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Sultan & Wayne.
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CALIFORNIA.

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Arnold, Ralph.
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Brown & Dozier.
Bullock, L. N. B.
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Caetani, Gelasio.
Caldwell, Forest B.
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Clark, Edwin M.
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Dennis, Clifford G.
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COLORADO.

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Carpenter's Sons, F. R.
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Chase, Edwin E.
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Dickerman, Alton L.
Dorr, John V. N.
Fairchild, O. H.
Farish, John B.
Finch, John Wellington.
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Hastings, John B.
Hills & Willis.
Lamont, Eugene M.
Lowe, Henry P.
Minard, Frederick H.
Moore, Charles J.
Parker, Richard A.
Parrish, K. C.
Purington, Chester W.
Rabb, Edw. M.
Revett, Ben Stanley.
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Townsend, Arthur R.
Van Wagenen, Theo. F.
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Warwick, A. W.

CONNECTICUT.

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IDAHO.

Easton, Stanly A.
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Sterling, Robert.
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ILLINOIS.

Carter, T. Lane.
Hollis, H. L.
Hunt & Co., Robert W.
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Roberts, Albert.

MASSACHUSETTS.

Crawford, Walter H.
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Wenstrom, Olof.

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McCormick, E.

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Collins, Edwin James.
Winchell, Horace V.

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Nicholson, Frank.

MONTANA.

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Greene, Fred T.
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Leggat, Alexander.

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Abbott, James W.
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NEW YORK.

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Del Mar, Alex.
Devereux & Sons, W. B.
Doveton, Godfrey D.
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Eveland, A. J.
Fearn, Percy L.
Finch, John Wellington.
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Garrey, George H.
Hammond, John Hays.
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Hill, Robt. T.
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Hunt & Co., Robert W.
Hutchins, J. P.
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Prosser & Walker.
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Ricketts & Banks.
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Rogers, A. P.
Rogers, Allen Hastings.
Rogers, Edwin M.
Semple, Clarence C.
Sharpless, Fred'k F.
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Simonds & Burns.
Spilsbury, E. Gybbon.
Spurr, J. Edward.
Spurr & Cox (Inc.).
Stonestreet, Geo. D.
Sussmann, Otto.
Thayer, Benjamin B.
Thurston, E. C.
Townsend, Arthur R.
Von Rosenberg, Leo.
Weed & Probert.
Weed, Walter Harvey.
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NORTH CAROLINA.

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OHIO.

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OREGON.

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PENNSYLVANIA.

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SOUTH DAKOTA.

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TEXAS.

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Spurr & Cox (Inc.).
Wallace & Summerhayes.

UTAH.

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Brown & Edwards.
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Neill, James W.
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WASHINGTON.

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CANADA.

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Keffer, Frederic.
Leckie, J. Edwards.
Levy, Ernest.
Loring, Frank C.
McEwen, Atholl F.
Moore, Phil H.
Roland, Walpold.
Williams, Percy.
Willmott, A. B.

FOREIGN.

AFRICA.

Ackermann, Audley H.
Bosqui, Francis L.
Broadbridge, W.
Rotherham, G. H.

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Dickson, A. A. C.
Drucker, A. E.
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Mitchell, Deane P.
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Prescott, Basil.
Stanford, Richard B.
Waterman, Douglas.

EUROPE.

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Bullock, L. N. B.
Collins, Henry F.
Curle, J. H.
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Hawxhurst & Wolff.
Heywood, William A.
Hill, Alexander.
Hoover, H. C.
Hoover, Theodore J.
Knox, Newton Booth.
Loring, W. J.
Nichols, Horace G.
Payne & Co., F. W.
Pearse, Kingston & Browne.
Perkins, Walter G.
Purington, Chester W.
Rickard, Edgar.
Rickard, T. A.
Rumbold & Reece.
Shockley, W. H.
Stewart, Charles H.
Titcomb, H. Abbot.
Weatherbe, D'Arcy.
Wright, Charles Will.

MEXICO.

Anderson, Robert Hay.
Auw & Ortiz Clarcke.
Babb, Percy Andrus.
Baird, Louis.
Besley, J. Campbell.
Botsford, C. W.
Bradley, D. H., Jr.
Brodie, Walter M.
Bumsted, Edward J.
Burrows, R. H.
Carpenter, Brennon & Ryan.
Colbath, James Sollitt.
Ford, N. O. S.
Grothe & Carter.
Hardy, J. W.
Heberlein, C. A.
Hobson & Co., Francis J.
Hoffmann, John D.
Hoyle, Charles.
Jacobs & Posada.
Janes, Byron E.
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McCausland, Ross D.
Mildon & Russell.
Nahl, Arthur C.
Ordonez, Ezequiel.
Paul, W. H.
Prichard, W. A.
Rabb, Edw. M.
Raymond, Robert M.
Rickard, Harold.
Royer, Frank W.
Tays, E. A. H.
Timmons, Colin.
Treadwell, John C.
Tweedy, Geo. A.
Warwick, A. W.

SOUTH AMERICA.

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Loram, S. H.
Macnutt, C. H.
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(CONTINUED ON PAGE 8.)

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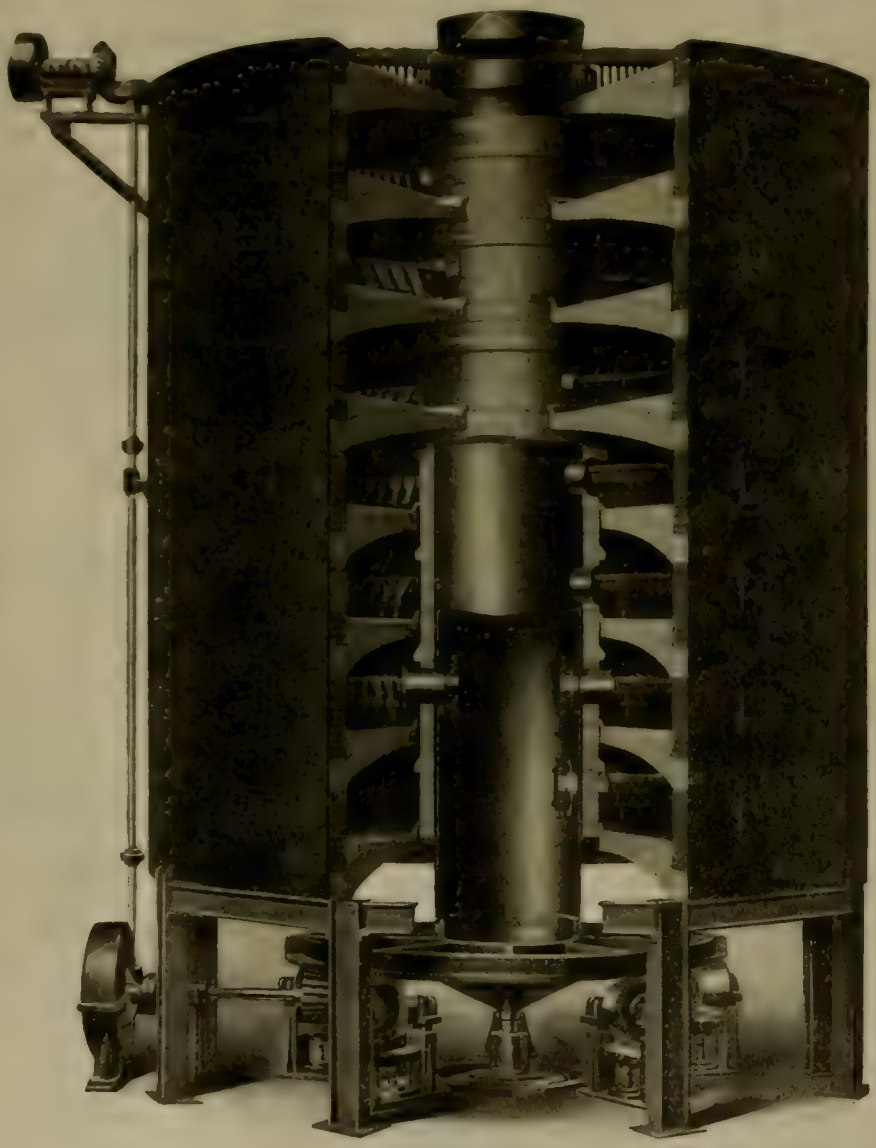

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Mining Engineers.
Ploche, Nevada.

ACKERMANN, Audley H.,
Mining Engineer.
Bulawayo, Rhodesia, South Africa.
Cable: Consulting. Usual Codes.

ADAMS, Henry,
Mining Engineer.
Twelve years in Spanish America.
33 Fremont St., New London, Conn.

ADAMSON, W. G.,
Consulting Mining Engineer and Metallurgist.
P. O. Box 69, Winnemucca, Nevada.

ADDITON, A. Sydney,
Metallurgical Engineer.
Cyanide Mill and Plant Construction.
318 Market St., San Francisco,
and Rhyolite, Nev.

ALDRIDGE, Walter H.,
Mining and Metallurgical Engineer
Canadian Pacific Railway.
Trail, B. C. Bankhead, Alta.

ALEXANDER, Wm. B., B.S.,
Consulting Mining Engineer.
Suite 2, Steinfeld Bdg.
Tucson, Arizona.

ANDERSON, Robert Hay,
Consulting Mining Engineer.
Apartado 866, Mexico City.
Cable: Anderson, Mexico.

ARGALL & SON, Philip,
Mining and Metallurgical Engineers.
Majestic Bdg., Denver.
Cable: Argall. Code: Bedford McNeill.

ARMSTRONG, L. K.,
Mining Engineer.
615 Hyde Block, P. O. Box 14, Spokane.
Codes: Lieber; Bedford McNeill.

ARNOLD, Ralph,
Consulting Geologist and Engineer.
Oil Properties a Specialty.
726 H. W. Hellman Bdg., Los Angeles, Cal.
Cable: Arnoil. Code: Bedford McNeill.

R. M. Atwater, Jr. Robert Linton.
M. W. Atwater. R. de Sallier.
ATWATER, LINTON & ATWATER
Mining Engineers.
Duluth, Minn. 36 Wall St., New York.

AUSTIN, L. S.,
Mining and Metallurgical Engineer.
Dooly Block, Salt Lake City, Utah.
Undertakes the charge of examinations and reports on mining properties.
Code: Bedford McNeill.

AUW & ORTIZ CLARCKE,
Mining Engineers, Assayers, Chemists.
Reports on Mines. Ore Shippers Agents.
Apartado 17, Velardena, Durango, Mex.
Code: A. B. C., 5th Ed.

BABB, Percy Andrus,
Mining and Metallurgical Engineer.
Edificio La Cia. Bancaria, Mexico, D. F.
Avenida 5 De Mayo No. 32.

BACON, W. S.,
Mining Engineer and Metallurgist.
Kerby, Josephine County, Oregon.

BAIN, H. Foster,
Associate Editor
MINING AND SCIENTIFIC PRESS.
No professional work undertaken.

BAIRD, Dudley,
Metallurgist and Engineer.
Specialty: Copper.
Care Pacific Foundry Co., San Francisco.
Cable: Smelturgy.

BAIRD, Louis,
Mining Engineer.
Examinations, Reports, Surveys.
Mill Design and Construction.
Maestranza 75, Guadalajara, Mexico.

BALL, Sydney H.,
Mining Geologist.
71 Broadway, New York.

BARD, Darsie C.,
Mining Engineer.
436-8 Phoenix Block,
Mining Geology. Butte, Montana.

BAXTER, Harold,
Consulting Mining Engineer.
417-418 Fleming Block, Phoenix, Ariz.
Examinations. Development work contracted.

BEADON, W. R. Coleridge,
Mining Engineer.
Care of King, King & Co.,
Bombay, India.

BEATTY, A. Chester,
Mining Engineer.
71 Broadway, New York.
Cable: Granitic. Code: Bedford McNeill.

Chas. M. Becker. Wm. W. Travell.
BECKER & TRAVELL,
Mining Engineer.
Mine Examinations and Managements.
337 Majestic Bdg., Denver.

BEELER, Henry C.,
Mining Engineer.
222 Boston Bdg., Denver.
Formerly State Geologist of Wyoming.

BELL, W. L.,
Mining Engineer.
417 Jamieson Building,
Spokane, Wash.

BENEDICT, William de L.,
Mining Engineer.
43 Cedar St., New York.

BERGSTROM, O. H.,
Mining and Copper Smelting.
Knudsen Pyritic Converter Smelting.
555 New York Block, Seattle, Wash.

BESLEY, J. Campbell,
Consulting Mining Engineer.
Hermosillo, Sonora.
Or Care Banco Occidental, Mazatlan,
Sinaloa, Mexico.
Code: Bedford McNeill.

BLAUVELT, Harrington,
Mining Engineer and Metallurgist.
Prescott, Arizona.
Mines examined and reported upon.

BLOW, A. A., E.M.,
Manager Mining Department
White Investing Co.,
43 Exchange Place, New York.

BOSQUI, Francis L.,
Metallurgical Engineer.
P. O. Box 149, Johannesburg, Transvaal.

BOTSFORD, C. W.,
Mining Engineer and Geologist.
Apartado 9, Guanajuato, Mexico.

BOTSFORD, Robert S.,
Mining Engineer.
Lavras Rio Grande do Sul, Brazil.
Cable: Botsford, Lavras Riograndedosul.

BRADLEY, D. H., Jr.,
Mechanical Engineer.
Specialty: Mining & Milling Machinery.
Examination & Equipment of Mexican Properties. Parral, Chihuahua, Mexico.

BRADLEY, Fred W.,
Mining Engineer.
Crocker Building, San Francisco.
Cable: Basalt. Code: Bedford McNeill.

BRANDES, Julian Felix,
Consulting Mining Engineer.
222 Equitable Bdg., Denver.

BRAYTON, Corey C.,
Mining Engineer.
309 Clunie Bdg., San Francisco.

BRETHERTON, S. E.,
Consulting Mining Engineer.
25 yr. experience Metallurgist and Mgr.
220 Mills Bdg., San Francisco, Cal.
Code: Bedford McNeill.

BREWER, Wm. M.,
Consulting Mining Engineer and Geologist.
P. O. Box 701, Victoria, B. C.

BRISTOL, J. J.,
Mining Engineer.
Reno, Nevada.

BROADBRIDGE, W.,
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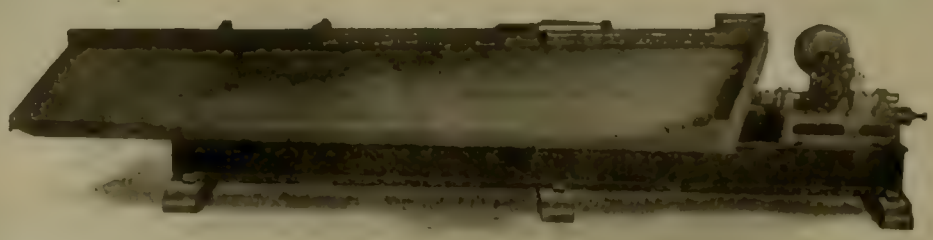

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Mining Engineer and Metallurgist.
Mexican Address: Box 219, Chihuahua.
New York Address: 45 Broadway.

BROWN, Cony T.,
Mining Engineer.
Socorro, New Mexico.
Secretary and Treasurer
New Mexico School of Mines.

BROWN, R. Gilman, E.M.,
Consulting Engineer.
62, London Wall, London, E. C.
Cable: Argeby, London. Usual Codes.

BROWN & EDWARDS,
Mining Engineers.
903 Boston Block, Salt Lake, Utah.
Code: Bedford McNeill.

BROWN, A. H. & DOZIER, C. T.,
Consulting Engineers.
Examination, development, management, ore testing, maps, models, surveys.
106 and 109 Lick Bdg., San Francisco.

BROWN-TOLMAN ENG. CO.,
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BULLOCK, L. N. B.,
Metallurgical Engineer.
With Chas. Butters & Co.,
54 New Broad St., London, E. C.
59th St., and Claremont Av., Oakland, Cal.

BUMSTED, Edward J.,
Mining Engineer.
Manager San Francisco Mine,
Taviche, Oaxaca, Mexico.

BURCH, Albert,
Mining Engineer.
Crocker Bdg., San Francisco.
Cable: Burch. Code: Bedford McNeill.

BURROWS, R. H.,
Mining Engineer.
Mine examinations and reports.
Apartado 212, Chihuahua, Mexico.

BURT, Edwin,
Metallurgical and Cyanide Engineer.
Late Supt. Cyanide Dept. El Oro Mining & R. R. Co., Ltd., El Oro, Mexico.
Mills and cyanide plants examined, designed and started. Specialty: Treatment of ores, fine grinding, and slime filtering. Patentee Burt Slime Filters.
303 Caples Bdg., El Paso, Texas.

BUTTOLPH, G. H.,
Mining Engineer.
Present address, Gambier, Ohio.
Gen. Mgr. Zapopan Gold Mining Co.

CAETANI, Gelasio,
Mining and Metallurgical Engineer.
Crocker Building,
San Francisco.
Cable: Caetani. Code: Bedford McNeill.

CALDWELL, Forest B.,
Mining Engineer.
Mine Examinations and Management.
Extended Mexican Experience.
Woodland, Cal.

CARPENTER'S SONS, Franklin R.,
Arthur Howe Carpenter,
Cranston Howe Carpenter,
Malcolm Howe Carpenter.
Cable: Carpenter. Equitable Bdg., Denver.

CARPENTER, BRENNON & RYAN
Mining Engineers.
519 La Mutua, City of Mexico
505 Union Trust Bdg., Los Angeles, Cal.

CARTER, T. Lane,
Mining Engineer.
With Osgood, Carter & Co.,
627 First National Bank Bdg., Chicago.

CHANCE, H. M., Coal.
Consulting Mining Engineer.
837 Drexel Bdg., Philadelphia.

CHANNING, J. Parke,
Consulting Engineer.
42 Broadway, New York.

CHASE, Charles A.,
Mining Engineer.
921 Equitable Bdg., Denver.
Liberty Bell G. M. Co., Telluride, Colo.

CHASE, Edwin E.,
Mining Engineer.
932 Equitable Bdg., Denver.

CHEYNEY, Sam. W.,
Mining Engineer.
237 First St., San Francisco.
Cable: Goldtop. Code: Bedford McNeill.

CHRISTMAN, Edward,
Specialist in Drilling Projects and Development of Mineral Lands.
Masillon, Ohio.

CLARK, C. C.,
Consulting Engineer.
Mines and Mining.
1003½ Broadway, Oakland, Cal.

CLARK, Edwin M.,
Mining and Metallurgical Engineer.
408-409 Bryson Bdg.,
Los Angeles, California.
Code: Moreing & Neal.

CLARKE, Roy H.,
Mining Engineer.
423 Rookery Bdg., Spokane, Wash.

CLAUDET & CO., Hyman,
Assayers, Metallurgists and Mining Engineers.
Ore Testing, Mills Designed & Erected.
Elmore Vacuum Process. Vancouver, B.C.

CLEMENTS, J. Morgan,
Economic Geologist and Mining Engineer.
Room 1707, 42 Broadway, New York.
Box 1183 Bisbee, Ariz. Code: Bed. McNeill.

CLEVENGER, G. Howell,
Metallurgical Engineer.
381 Hawthorne Ave., Palo Alto, Cal.
Code: Bedford McNeill.

COLBATH, James Sollitt,
Mining and Metallurgical Engineer.
Manager
El Rayo Mining & Developing Co., S. A.
Santa Barbara, Chihuahua, Mexico.

COLE, F. L.,
Mining Engineer.
P. O. Box 197, Vladivostok, Siberia.
Cable: Cole.

COLLINS, Edgar A.,
Mining Engineer.
Montana Tonopah Mining Co.,
Tonopah, Nev.
106 Pacific Ave., Piedmont, Cal.

COLLINS, Edwin James,
Mining Engineer.
1008-1009 Torrey Bdg., Duluth, Minn.
Mine Examinations and Management.

COLLINS, George E.,
Mining Engineer.
Mine Examinations and Management.
420 Boston Bdg., Denver.
Cable: Colcamac.

COLLINS, Henry F.,
Mining Engineer.
Huelva Copper & Sulphur Co., Ltd.,
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COULDREY, Paul S.,
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Supt. Mother Lode Mine, B. C. Copper Co.,
Greenwood, B. C., Canada.

COX, W. Rowland,
Management and Operation of Mines.
165 Broadway, New York.
(Spurr & Cox, Inc.)

Thomas Cox. Edmund Juessen.
COX & JUESSEN,
Mining and Metallurgical Engineers.
First National B'k Bdg., San Francisco.

CRAWFORD, Walter Howard,
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Life Member American Institute Mining Engineers.
181 Huntington Ave., Boston, Mass.

CROOK, Charles E.,
Mining and Mechanical Engineer.
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DAKIN, Fred H., Jr.,
Mining Engineer.
410 Studio Bdg., Berkeley, California.

DAVIS, Wm. H.,
Consulting Metallurgical Engineer.
Examinations and Reports. Mills Designed and Erected. Boulder, Colorado.

DEFTY, W. E.,
Mining Engineer.
Phoenix, Arizona.
Cable: Wed. Codes: Lieber, McNeill.

DE KALB, Courtenay,
Mining Engineer and Metallurgist.
Associate Editor
MINING AND SCIENTIFIC PRESS.

DEL MAR, Alex.,
Mining and Consulting Engineer.
(Formerly Consulting Engineer to the U. S. Monetary Commission.)
No. 1 Madison Ave., New York.

DEMAREST, D. C.,
Mechanical Engineer.
Plans and Specifications for Mining Machinery.
503 Market St., San Francisco.

DENNIS, Clifford G.,
Mining Engineer.
Crocker Bdg., San Francisco.
Cable: Terlinquite. Code: Bedford McN.

DERBY, Chas. C.,
Mining Engineer.
Virginia City, Nevada.
Code: Bedford McNeill.

DEVEREUX, W. B., & SONS,
Consulting Mining Engineers.
64 Wall St., New York.
Cable: Walbush. Code: Moreing & Neal.

DICKERMAN, Alton L.,
Consulting Mining Engineer.
Colorado Springs, Colorado.
Cable: Dickerman.

DICKSON, Archibald A. C.,
Mining Engineer.
Rejoulie P. O., India.
Via. Nawadah E. I. Railway.
Cable: Dickson, Nawadah. Usual Codes.

DORR, John V. N.,
Metallurgical Engineer.
Specialty: Cyanidation.
The Dorr Classifier.
728 Equitable Bdg., Denver. Pluma, S. D.

DOVETON, Godfrey D.,
Metallurgical Engineer.
Specialist in Milling.
165 Broadway, New York.
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DRAPER & CO., T.,
Mining Engineers.
39, Salisbury House, London, E. C.
Cable: Draperian. Usual Codes.

DRUCKER, A. E.,
Consulting Metallurgist
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H. W. DuBois, Philadelphia, Pa. C. T. Mixer, Salt Lake City, Utah.
DuBOIS & MIXER, Mining Engineers.
302 Harrison Bdg., Philadelphia.
Cable: Mixerdubos. Code: McNeill.

DUFOURCQ, Edward L.,
Mining Engineer.
Room C 22-23-24 Produce Exch. Annex, New York.
Cable: Dufourcq. Code: McNeill.

DWIGHT, Arthur S.,
Mining Engineer and Metallurgist.
25 Broad St., New York.
Cable: Sinterer.
Codes: Bed. McNeill; Miners & Smelters.

EASTON, Stanly A.,
Mining Engineer.
Manager Bunker Hill & Sullivan Mining & Concentrating Company, Kellogg, Idaho.

EDSALL, Burroughs,
Mining Engineer.
Clay Peters Bdg., Reno, Nevada.

EVANS, Horace Francis,
Economic Geologist.
Geologic Examinations and Reports.
Box 343, Grants Pass, Oregon.

EVANS & CRAUFURD,
Consulting Mining Engineers.
Silver City, New Mexico.

EVELAND, A. J.,
Mining Engineer.
With General Development Co.,
42 Broadway, New York.

FAIRCHILD, O. H.,
Consulting, Mining and Metallurgical Engineer.
Exam's, Reports, Mills Designed, Erected
202-3 Exchange Bdg., Denver.

FARISH, John B.,
Mining Engineer.
517-520 Cooper Bdg., Denver.
Cable: Farish.

FARRELL, J. R.,
Mining Engineer.
473 Vernon St., Oakland, Cal.

FEARN, Percy L.,
Mining Engineer.
36 Wall St., New York.

FERGUSON, Donald,
Consulting Mining Engineer.
Pittsburg-Nevada Min. Co., Arizona & Eastern Mines Co., Nevada Queen Mines Co., Congo Tunnel, Frances Group Mining Co., Hombre Mines Co., Rialto Mining Co., Ballymoor Mining Co.
P. O. Box 644. Goldfield, Nevada.
Codes: Moreing & Neal; Bedford McNeill.

FERRIER, W. F.,
Mining Engineer and Geologist.
Mammoth, Shasta Co., Cal.
Mining Geologist, U. S. Smelting, Refining & Mining Co.

FINCH, John Wellington,
Geologist and Engineer of Mines.
71 Broadway, New York.
812 Ideal Bdg., Denver.

FINLAY, J. R.,
Mining Engineer.
Room 2213, 2 Rector St., New York, or Goldfield, Nevada.

FISHBACK, Martin,
Mining Engineer.
Guaranty Trust Bdg., El Paso, Texas.
Cable: Fishback. Code: Western Union.

FISHER, Wm. B.,
Mining Engineer.
Manager Salt Lake Copper Co.
318 Herald Bdg., Salt Lake, Utah.

FLEMING, John B.,
Mechanical and Metallurgical Engineer.
Specialty: Mill and Power Plant Design and Construction.
75 Fremont St., San Francisco.

FORD, N. O. S., M.S., E.M.,
Consulting Mining Engineer.
Apartado 130, Oaxaca, Mexico.
Code: Moreing & Neal.

FORRESTER, R.,
Geologist and Mining Engineer.
621-624 Newhouse Bdg.,
Salt Lake, Utah.

FORSTNER, William,
Mining Engineer.
1120 Stanyan St., San Francisco.

FOWLER, Edw. J.,
Metallurgist and Engineer.
Specialty: Copper.
Care Pacific Foundry Co., San Francisco.
Cable: Smelturgy.

FOWLER, Samuel S.,
Mining Engineer and Metallurgist.
Nelson, British Columbia.

FOX, James H.,
Mining Engineer.
Examinations, Reports and Affidavits. Advice on Treatment of Ores.
1260 Empire Block. Seattle, Wash.

FUELLER, C. M.,
Mining Engineer.
Consultations, Examinations and Mill Installations.
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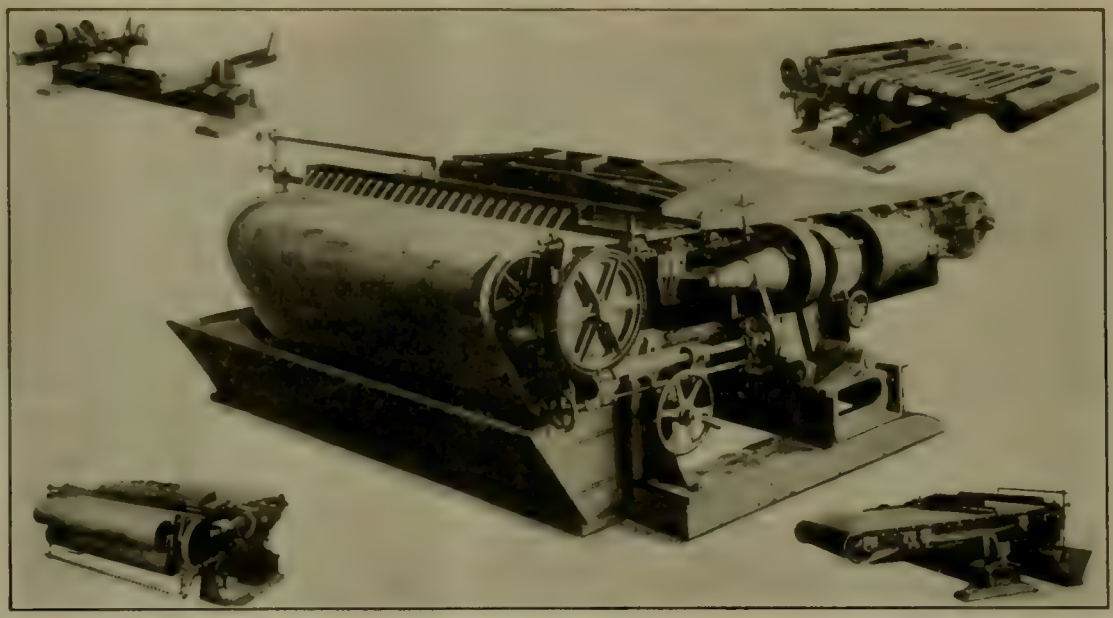
¶ If you will carefully study the different views shown in the cuts, you will realize its mechanical superiority. Actual practice has proved its metallurgical benefits.



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GAMBA, F. Pereira, C.M.E.,
Examinations and Reports on Mines.
Pasto, Colombia, South America.
Via Panama y Tumaco.

GARREY, George H.,
Mining Geologist and Engineer.
Specialist in Detailed Geol. Surveys.
165 Broadway, New York.
(Spurr & Cox, Inc.)

GARRISON, F. Lynwood,
Mining Engineer.
760 Drexel Bdg., Philadelphia.
Cable: Craigdex. Code: Bedford McNeill.

GASSAWAY, A. D.,
Mining Engineer.
1931 Parker St., Berkeley, California.
Code: Bedford McNeill.

GILKERSON, H. G.,
Mining Engineer.
726 Boston Bdg., Salt Lake, Utah.
Code: Bedford McNeill.

GOODALE, David,
Mining Engineer.
2301 Stuart St., Berkeley, California.

GRACEY, A. H.,
Mining Engineer.
Specialty: Free Gold Mining and Milling.
Nelson, B. C.

GREENE, Fred T.,
Mining Geologist.
Silver Bow Club, Butte, Mont.
Geological Mapping.
Code: Bedford McNeill.

GREENLEY, Louis A.,
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HAGGOTT, Ernest A.,
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2525 West 18th Street,
Los Angeles, Cal.

HALL, Leon M.,
Consulting Engineer
In Mechanics, Electricity & Mining.
Room 814 Kohl Bdg., San Francisco.

HAMMOND, John Hays,
Consulting Engineer.
71 Broadway, New York.
Code: Bedford McNeill.

HARDMAN, John E.,
Consulting Mining Engineer.
112 St. James St., Montreal, Canada.

HARDY, J. Gordon,
Consulting Mining Engineer.
Special Mexican Experience.
City Bank Bdg., El Paso, Texas.
Code: Bedford McNeill.

HARDY, J. W., C.E., E.M.,
332 La Mesa, Cananea,
Sonora, Mexico.

HARTLEY, Carney, M.E.,
Placer Mining Engineer.
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Mining and Consulting Engineer.
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HASTINGS, John B.,
Mining Engineer.
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HEBERLEIN, C. A.,
Consulting Engineer and Metallurgist.
Calle de Madrid 15, Mexico, D. F.

HEPBURN, Arthur E.,
Mining Engineer.
317 Winch Bdg., Vancouver, B. C.
Cable: Ruktra. Code: Bedford McNeill.

HERSHEY, Oscar H.,
Mining Geologist.
Kellogg, Idaho.

HERZIG, Charles S.,
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42 Broadway, New York.

HEYWOOD, William A.,
Consulting Metallurgist.
4 Broad Street Place,
London, E. C., England.

HILL, Alexander,
Mining Engineer.
4 Broad St. Place, London, E. C.
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HILL, Robt. T.,
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Apartado 42, Guanajuato, Mexico.
Cable: Hobson. Code: Bedford McNeill.

HOFFMANN, John D.,
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Cable: Tundra, Zacatecas.

HOFFMANN, Ross B.,
Mining Engineer.
319 First Nat. Bank Bdg., Oakland, Cal.
Cable: Rosshof.

HOHL, L. J.,
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1834 Delaware St., Berkeley, Cal.

HOLLAND, Chas H.,
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Cable: Reduction, Auckland.
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HOLLIS, H. L.,
Consulting Mining Engineer and Metallurgist.
1417 First National Bank Bdg., Chicago.

HOOVER, H. C.,
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1 London Wall Bdgs., London, E. C.
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HOOVER, Theodore J.,
Consulting Mining Engineer.
Specialty—Flotation Concentration Process.
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69 Wall St., New York.

HOWSON, James W.,
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217 Humboldt Bk. Bdg., San Francisco.

HOYLE, Charles,
Mining Engineer.
Apartado 8, El Oro, Mexico.

HUBBARD, J. D.,
Metallurgical Engineer.
Specialty: Pyritic Gold Ores.
Santa Clara, Cal.

HUMPHREYS, Llewellyn E.,
Mining and Metallurgical Engineer.
205 Newhouse Bdg., Salt Lake, Utah.
Code: Bedford McNeill.

HUNT, Bertram,
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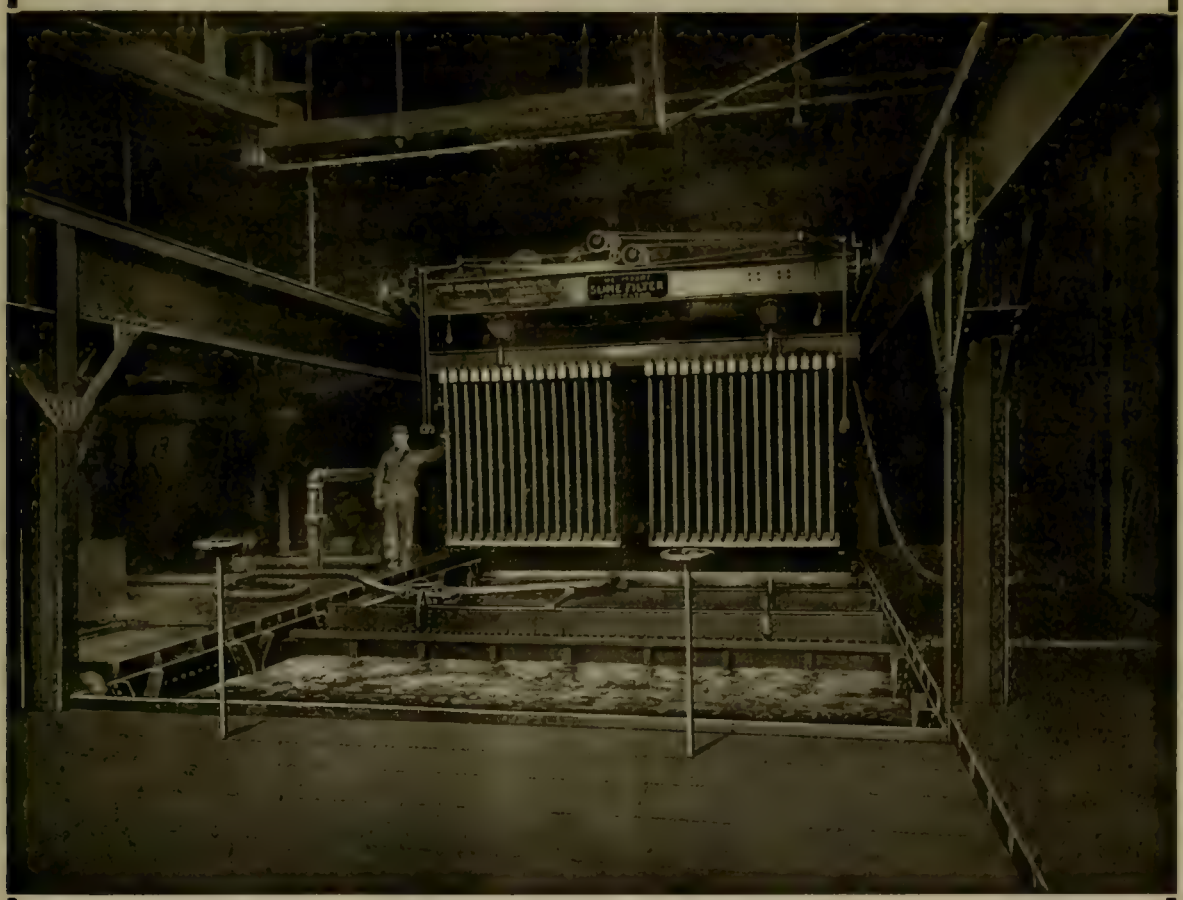

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Chicago–San Francisco–New York–Pittsburg
San Francisco Office, 425 Washington St.
St. Louis–Montreal–London.
Consulting, Designing and Supervising Engineers. Inspectors of Railroad, Structural and other Materials and Equipment. Chemical and Physical Laboratories.

HUTCHINS, John Power,
Mining Engineer.
52 Broadway, New York.
Cable: Jakuch.

IRWIN, Frederic,
Mining Engineer.
General Manager, Trade Dollar Consolidated Mining Company,
Dewey, Idaho.

G. B. Jacobs. Julio Posada.
JACOBS & POSADA,
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Mines reported on. Plans and Specifications furnished for Metallurgical Plants.
P. O. Box 229, Chihuahua, Mexico.
Code: Bedford McNeill.

JANES, Byron E.,
Mining Engineer.
Santiago Papasquiaro, Durango, Mexico.
Mine Examinations.
Code: Bedford McNeill.

JANIN & SMITH,
Consulting Mining Engineers.
619 Kohl Bdg., San Francisco.
Cable: Diorite. Code: Bedford McNeill.

JENKS, Arthur W.,
Mining Engineer and Metallurgist.
2231 Cedar St., Berkeley, Cal.
Cable: Jenks. Code: Bedford McNeill.

JENNINGS, E. P.,
Mining Engineer.
Salt Lake City, Utah.
Cable: Chalcocite, Salt Lake.
Code: Bedford McNeill.

JEWELL, William R.,
Mining Geologist—Oil Reports.
Formerly Mineral Expert Dept. of Interior.
P. O. Box 163, Bakersfield, Cal.
Cable: Jewell. Code: Bedford McNeill.

JOHNSON, Roswell H.,
Consulting Geologist.
Specialty: Oil and Gas in the Mid-continent and Rocky Mountain States.
Bartlesville, Oklahoma.

JONES, R. W.,
Mining Engineer.
Christobal, Canal Zone.
Panama.

KEFFER, Frederic,
Consulting Engineer and Geologist.
With the British Columbia Copper Co., Ltd., Greenwood, B. C.

KEHOE, Henry,
Mining Engineer.
Mine Examinations, Development, Management.
1123 S. Wall St., Spokane, Wash.

KEMP, William,
Mining Engineer.
Tucson, Arizona.

KERR, Mark B.,
Consulting Mining Engineer.
Pittsburg Gold Flat Mines Co.
Mills Bdg., San Francisco.
Present address, Nevada City, Cal.

KIRBY, A. G.,
Metallurgist.
Ore testing, mill design & construction.
Specialty—Concentration & cyanidation.
19-20 Gazette Bdg., Reno, Nev.

KIRBY, Edmund B.,
Mining Engineer and Metallurgist.
701 Security Bdg., St. Louis.
Specialty: The expert examination of mines and metallurgical enterprises.

KNOX, Newton Booth,
Mining Engineer.
Finsbury House, Blomfield Street, London, E. C.

KRUMB, Henry,
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KUPHAL, Henry E.,
Mining Engineer.
Box 535, Missoula, Montana.

LAKENAN, C. B.,
Mining Engineer.
Ely, Nevada.

LAMB, MARK R.,
Milling and Cyaniding Engineer.
Milwaukee, Wis. (Allis-Chalmers Co.)
Cable: Marklamb, Milwaukee.
Usual Codes.

LAMONT, Eugene M.,
Gen. Mgr. The Arizona Gold Mines Co., Kingman, Ariz.
Raymond Con. Mines Co., Ohio City, Colo.
408 Ideal Bdg., Denver.

LANAGAN, W. H.,
Mining Engineer.
Nome, Alaska.
Code: Bedford McNeill.

LANDERS, W. H.,
Mining and Consulting Engineer.
Standard Consolidated Mining Company, Bodie, California.

LAWRENCE, Benjamin B.,
Consulting Mining Engineer.
60 Wall St., New York.

LAWTON, E.M.,
Mexican Investments. Lands. Water Powers. Mines. Also U. S. Assay Offices.
Oaxaca, Mexico.
Cable: Lawton. Code: A. B. C., 4th Ed.

LECKIE, J. Edwards,
Mining and Consulting Engineer.
P. O. Box 355. Cobalt, Ontario.

LEFEVRE, Henry F.,
Mining Engineer.
71 Broadway, New York.
Cable: Quique. Code: Bedford McNeill.

LEGGAT, Alexander,
Mining Engineer.
Examinations and Surveys.
Butte, Montana.
Code: Bedford McNeill.

LEGGETT & HELLMANN,
Consulting and Mining Engineers.
25 Broad St., New York.
519 California St., San Francisco.
Cable: Legmann.

LEVY, Ernest,
Mining Engineer.
Representating Alex. Hill & Stewart, Rossland, British Columbia.

LIDSTONE, E. D.,
Mining and Mechanical Engineer.
Cordova, Alaska.
Consulting Engineer Cordova Power Co.

LLOYD, R. L.,
Metallurgist.
25 Broad St., New York.

LONG, Frederic H.,
Consulting Mining and Metallurgical Engineer.
Schiller Bdg., Chicago.

LORAM, S.H.,
Mining and Metallurgical Engineer.
Care Messrs. Gibbs & Co.,
Valparaiso, Chile, S. A.
Cable: Loram. Usual Codes.

LORING, Frank C.,
Mining Engineer.
Home Life Building, Toronto, Ontario.

LORING, W. J.,
Mining Engineer.
62 London Wall, London, E. C.
Cable: Bewick, London. Usual Codes.

LOWE, Henry P.,
Consulting and Mining Engineer.
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LOWELL, Fred. L.,
Mining Engineer.
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Home telephone C 4317.

LYON, EDW. W.,
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276-278 Benbow Arcade.
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Los Angeles, Cal.

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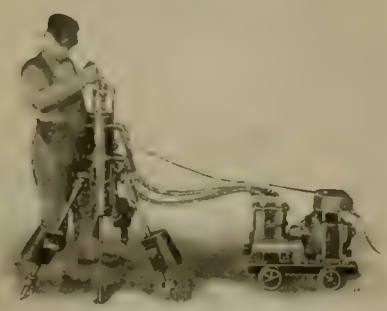

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MARSTERS, V. F.,
Consulting Geologist.
Petroleum fields, Peru, a specialty.
Apartado 856, Lima, Peru, S. A.

MAYNARD, George W.,
Consulting Mining and Metallurgical Engineer.
20 Nassau St., New York.

MAYREIS, L. J.,
Mining Engineer.
Collahuisi, Chile.
Cable: Mayreis.
Codes: M. & S.; Bedford McNeill.

McCAUSLAND, Ross D.,
Mining Engineer.
Apartado 299, Chihuahua, Mexico.

McCORMICK, E.,
Mining Engineer.
Calumet, Michigan.
Examinations, Reports, Management.

McELROY & SMITH,
(John G. McElroy, J. J. Smith.)
U. S. Mineral Surveyors.
Reno, Nevada.
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McEWEN, Atholl F.,
Mining Engineer.
Box 525, Cobalt, Ontario, Canada.

McKIM, J. W.,
Mining Engineer.
532 Dooly Block, Salt Lake, Utah.

McLENNAN & FARISH,
(John F. McLennan, Wm. A. Farish, Jr.)
Mining Engineers.
Examinations, Reports, Consultations.
Box 392, Los Angeles, Cal.

MACNUTT, C. H.,
Mining Engineer.
Gen. Mgr. Poderosa Mining Co., Ltd.
Antofagasta, Chile.
Cable: Macnutt. Codes: Bed. McN.:M. & S.

MERCER, John W.,
Mining Engineer.
Mills Bdg., Broad St., New York.
Gen. Mgr. South American Mines Co.

MERRILL, Frederick J. H.,
Mining Engineer and Geologist.
(Late State Geologist of New York.)
212 Columbia Trust Building,
Los Angeles, Cal.

MERRILL, Charles W.,
Metallurgist.
143 Second St., San Francisco.
Cable: Lurco. Codes: Bedford McNeill and Moreing & Neal.

MESSITER, E. H.,
Engineer.
25 Broad St., New York City.

R. B. Mildon. B. E. Russell.
MILDON & RUSSELL,
Mining Engineers.
Nacozari, Sonora, Mexico.

MILLER, Bernard P.,
Mining Engineer.
P. O. Box 1160, Goldfield, Nevada.

MINARD, Frederick H.,
Mining Engineer.
Trinity Bdg., 111 Broadway, New York.
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MITCHELL, Deane P.,
Mining Engineer.
Equitable Building, Melbourne.
General Manager for
Bewick, Moreing & Co.

MOODIE, J. W. D.,
Engineer.
1017 Story Bdg., Los Angeles, Cal.
Reports, Surveys, Estimates, and Construction of Transportation Projects.

MOORE, Charles J.,
Consulting Mining Engineer.
741 Equitable Bdg., Denver.
Telephone: Residence, York 673.

MOORE, Phil H.,
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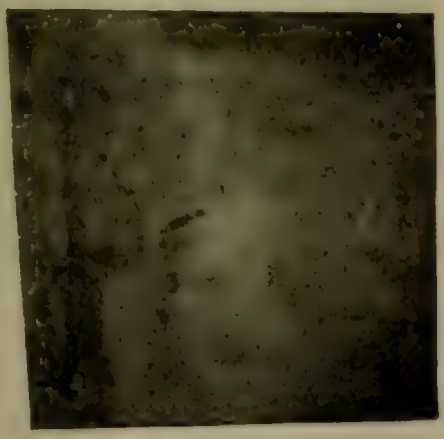

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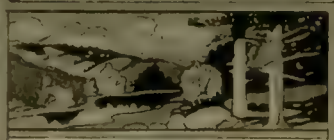

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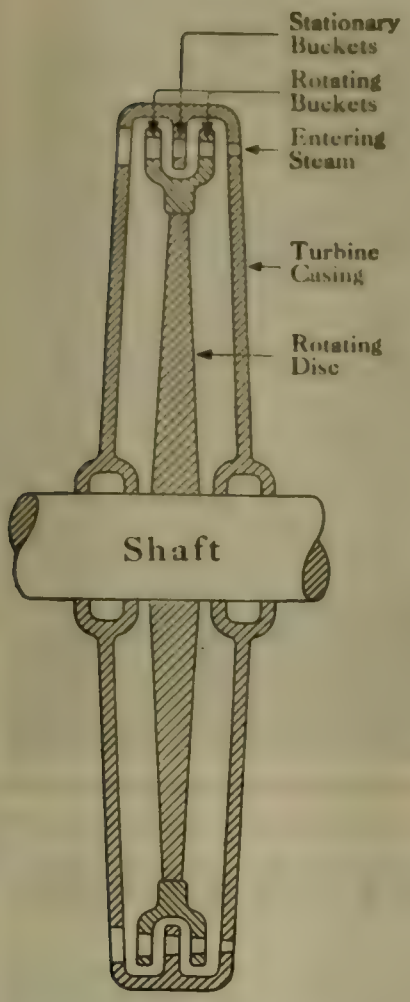

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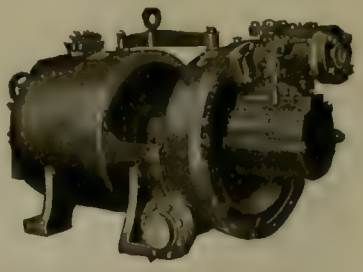

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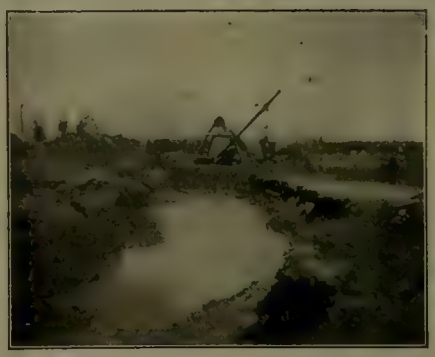

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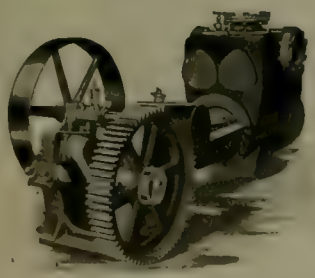

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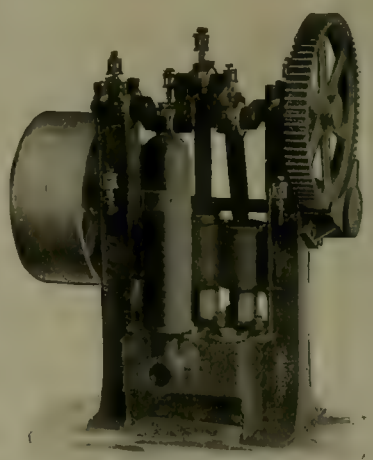

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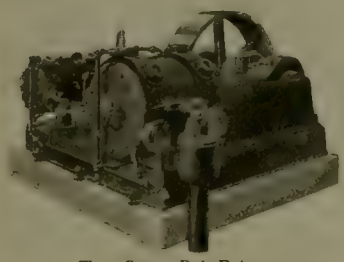

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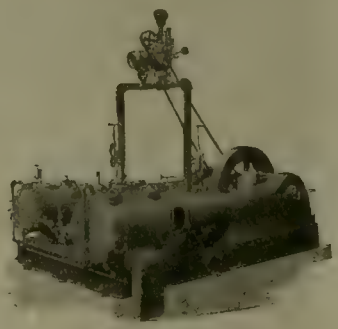

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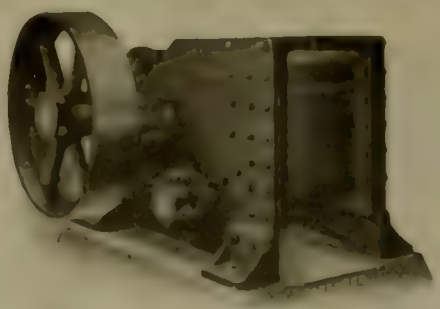

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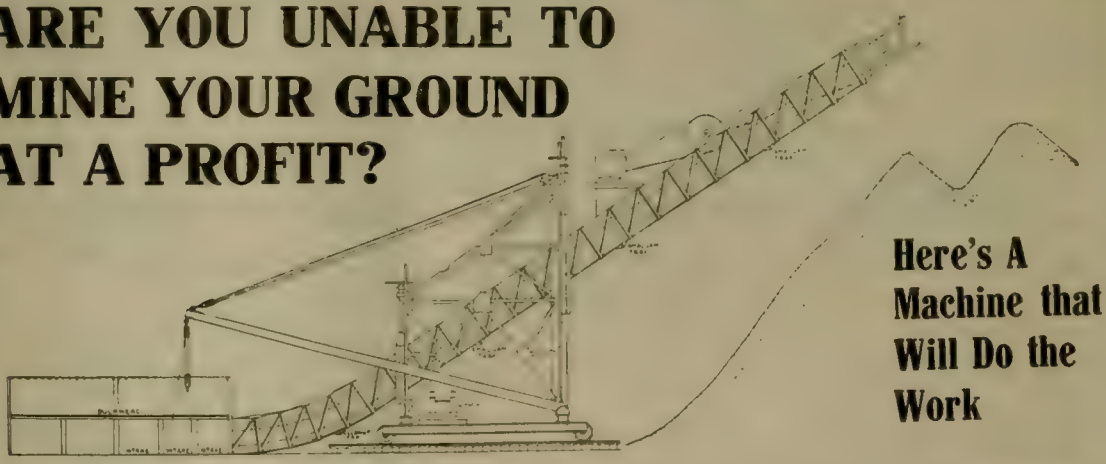

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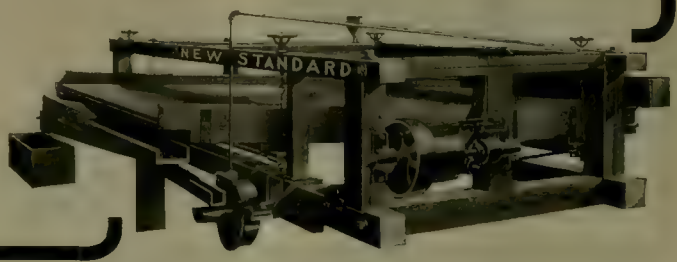

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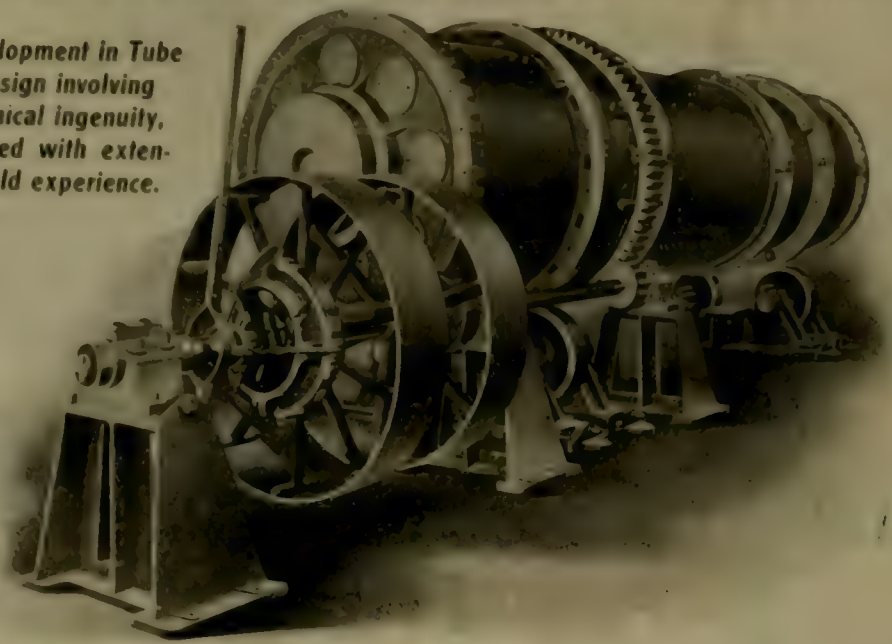

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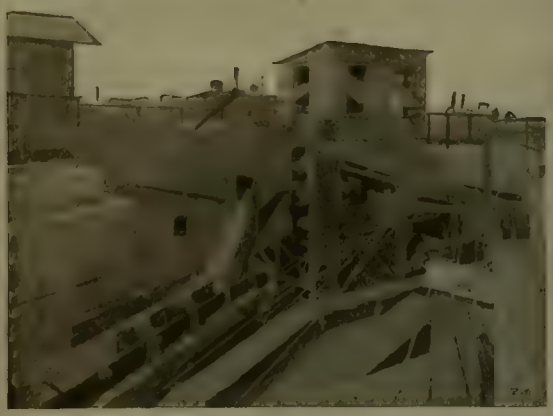

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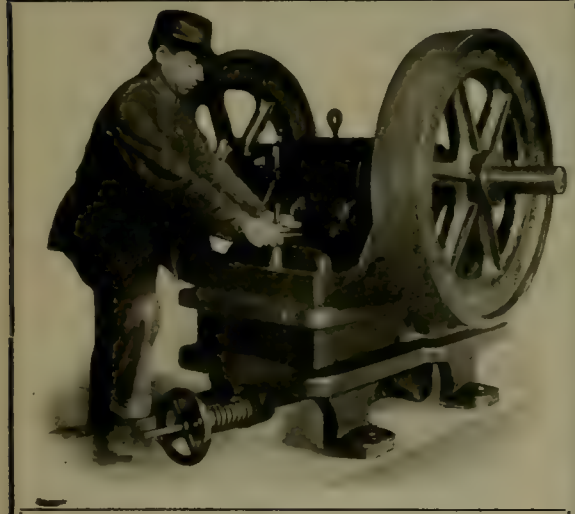

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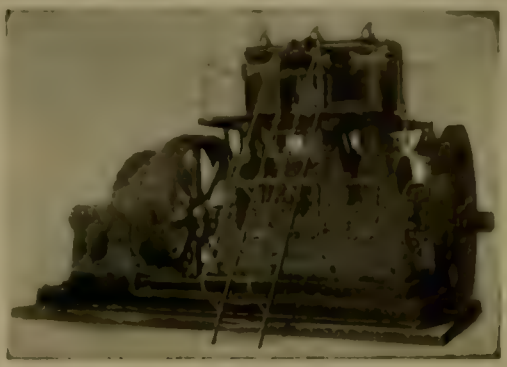

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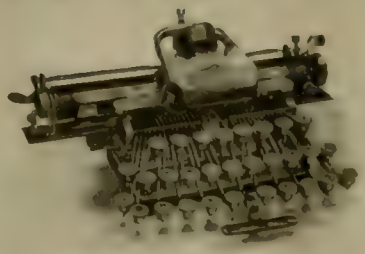

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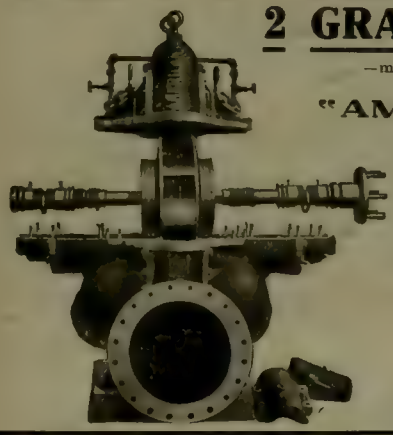

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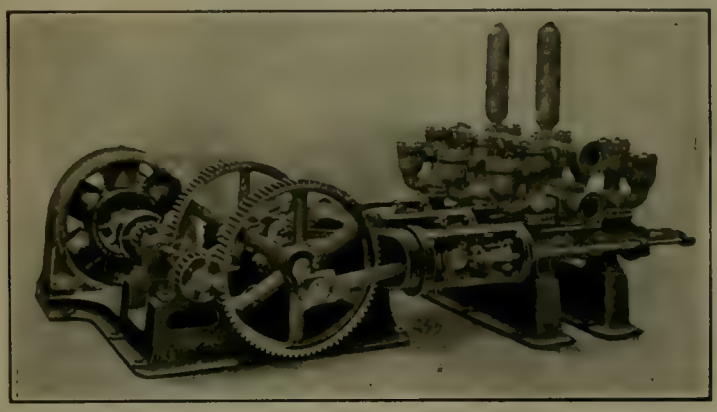

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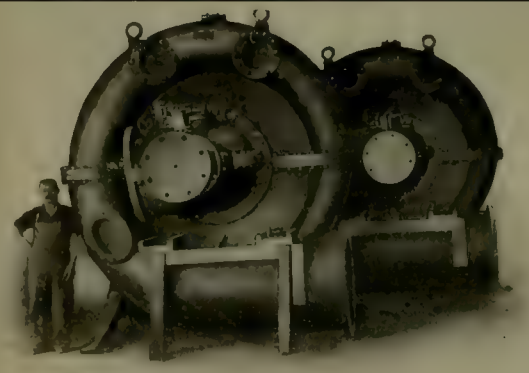

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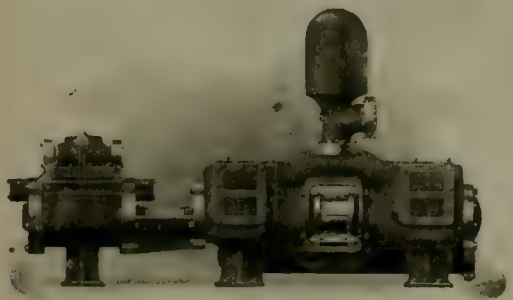

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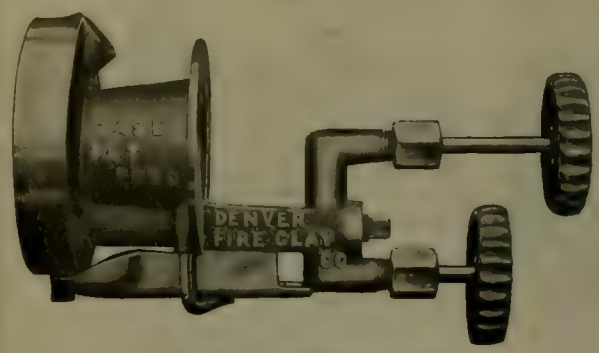

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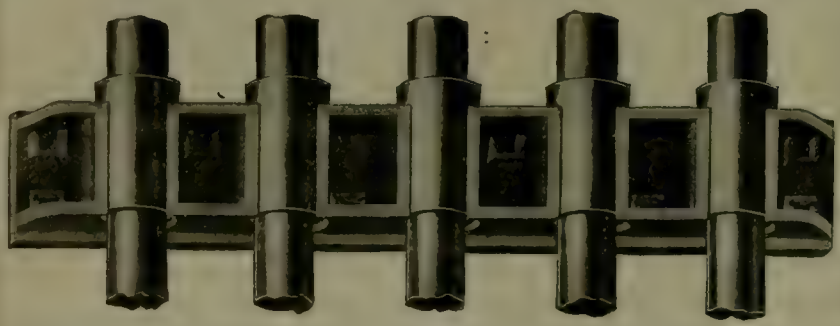

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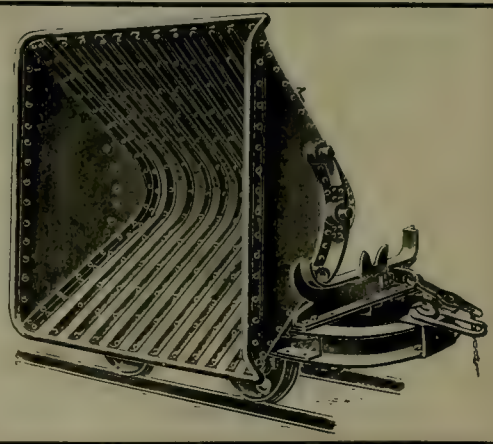

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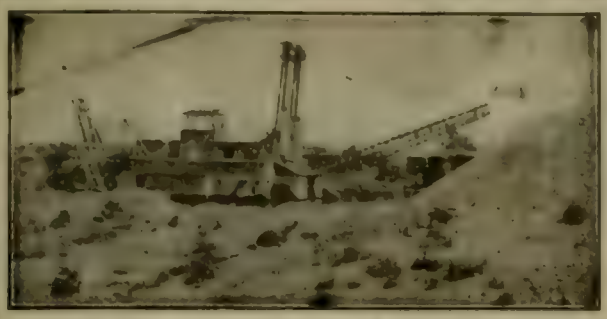

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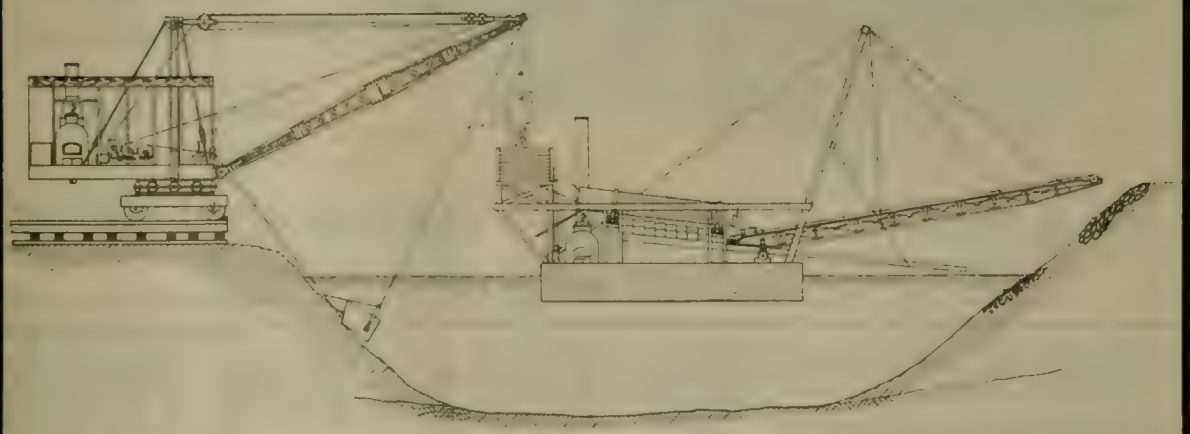

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Estimates and recommendations submitted upon receipt of necessary data.

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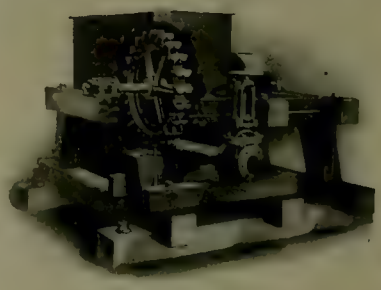

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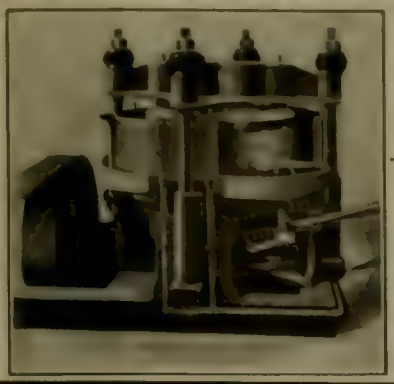

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Power required, 8 H P
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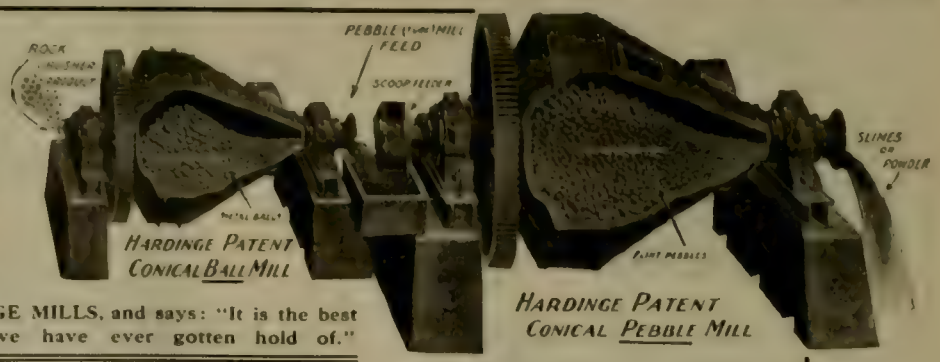

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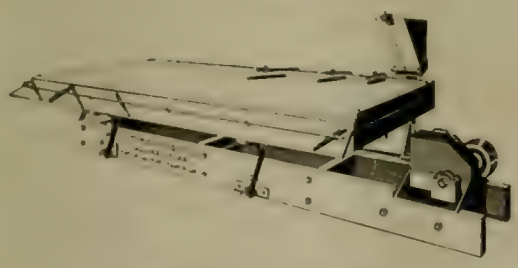

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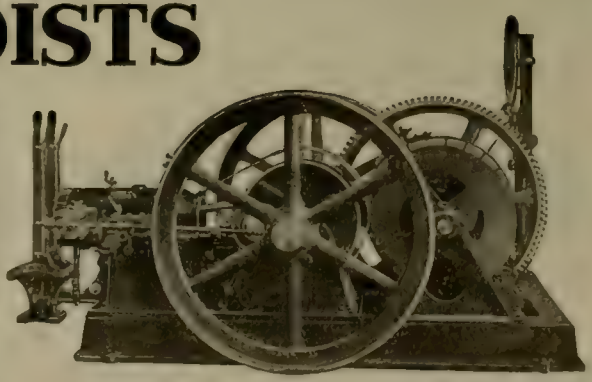

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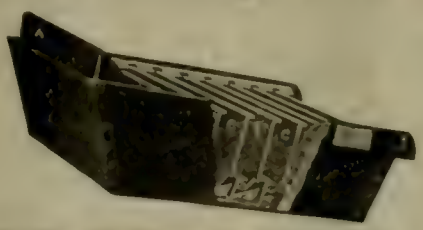

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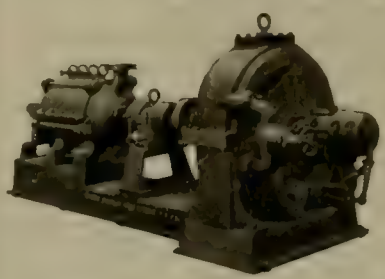

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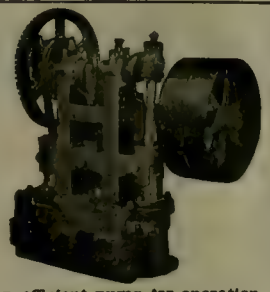

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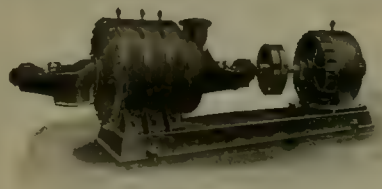

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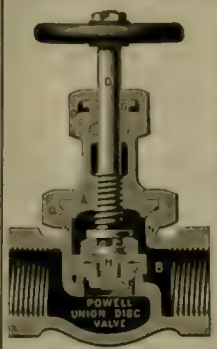

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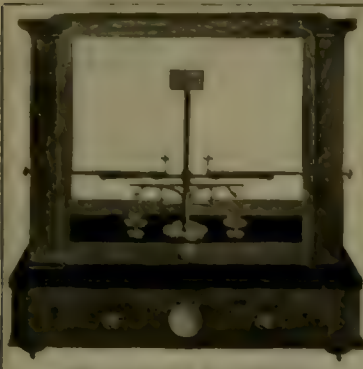

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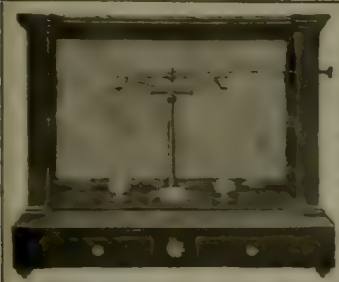

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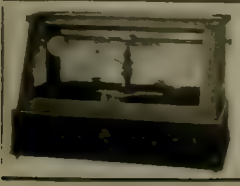

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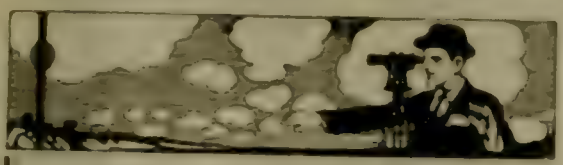

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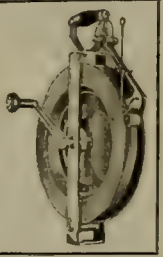

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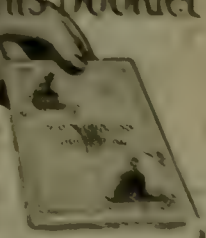

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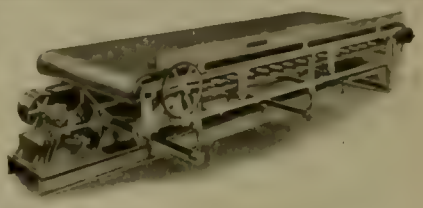

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Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press United States and Foreign Patent Agency, the following are worthy of special mention:

HARVESTERS.—No. 960,799; June 7, 1910. Arthur R. Blewett, Spokane, Wash. This invention is designed to eliminate a number of cumbersome parts heretofore used in the construction of combined harvesters, to provide improvements in the operation of all the parts of such a machine, to reduce the friction in the moving parts, to lighten the weight of the harvester and to shorten its length so that it may be operated by less horse or other power than has been heretofore possible, thus making it practicable to use the machine under conditions where a larger and heavier machine cannot be used, and in general to secure a greater economy in the cost of its construction and operation.

GLOVE REVERSING DEVICES.—No. 960,937; June 7, 1910. Augustus F. Imbrie, San Francisco, Cal. This invention relates to a device for reversing gloves, and turning them right side out after the stitching which is done on the inside, has been completed. It is the object of this invention to provide a means to rapidly, accurately and carefully turn the gloves without marring the fabric, which is often very delicate. A device of this character enables the operator to turn out four or five times more work than by the original slow hand method, and as the ends of the fingers are held between the two rods all danger of marring or breaking the surface of the leather is avoided.

REDUCING VALVES.—No. 960,758; June 7, 1910. George E. Witt, San Francisco, Cal. It is the object of this invention to provide a simple, cheap, practical and reliable valve operated by diaphragm and springs and so constructed that the valve itself is not connected with the diaphragm; and with which valve the trouble caused in a piston actuated reducing valve is overcome, as it is impossible for this valve to stick. It is also an object of this invention to provide a valve of this sort in which there is no chattering or blowing through, and which can be ground or re-seated at any time without expense for new parts.

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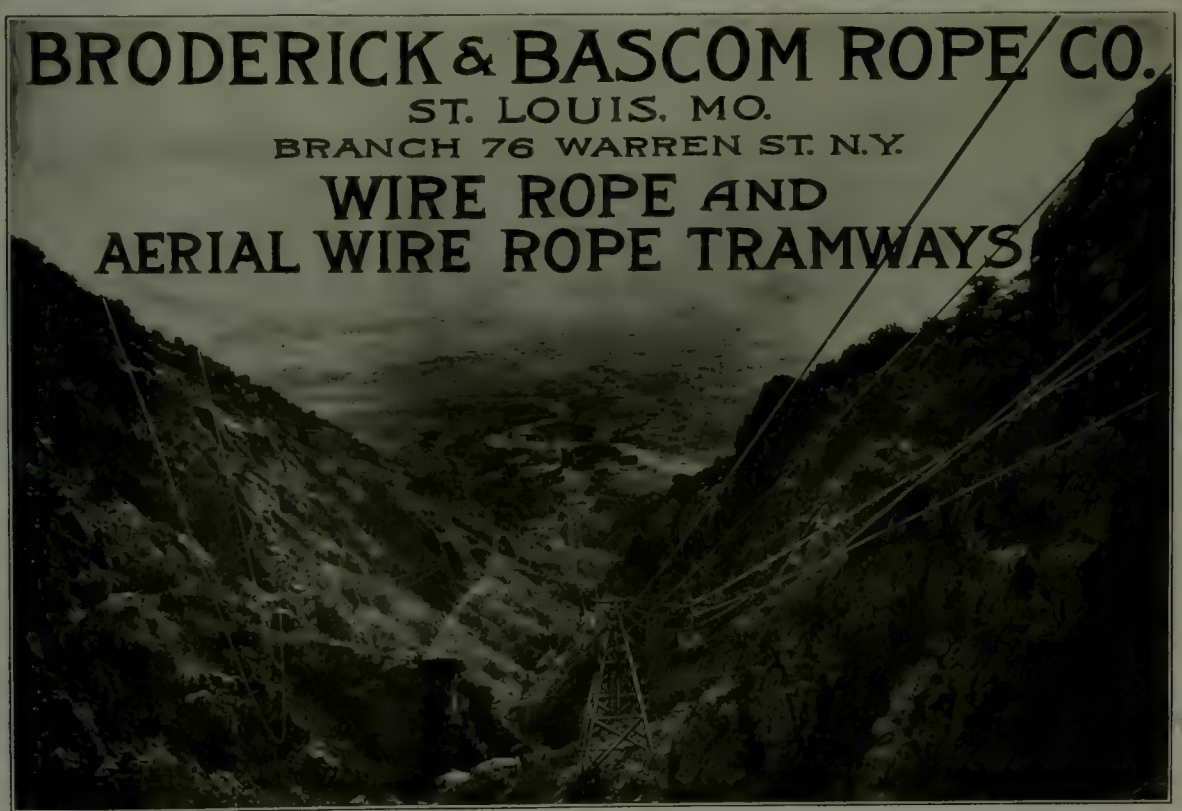

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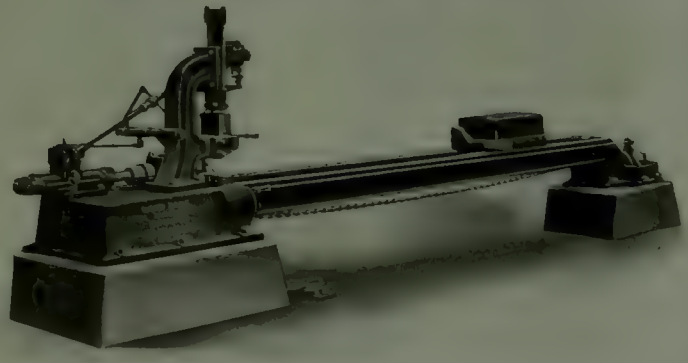

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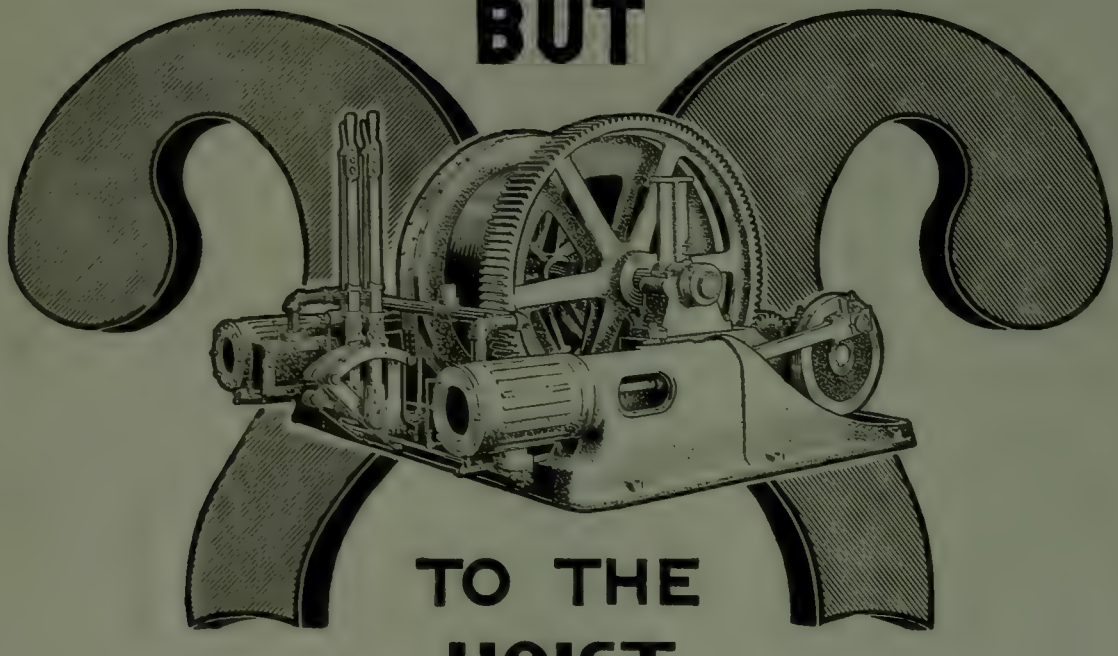

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EDITORIAL

THE AMERICAN SOCIETY for Testing Materials, one of the most useful of the smaller engineering organizations of the country, has been in session at Atlantic City. The meeting was called to order by Mr. Robert W. Lesley, vice-president. Mr. Henry M. Howe was elected president to fill the place made vacant by the death of C. B. Dudley, so long prominently connected with the activities of the society.

LAKE traffic is heavy this season and marks a large increase in industrial activity in the Middle West. Freight movement up and down Detroit river this year has been nearly double that for 1909. In May, according to the Bureau of Statistics, merchandise shipments on the Lakes were 80 per cent greater than last year and a million and a half tons more than in 1907, the record year. Iron ore shipments for the month were 6,005,329 gross tons and from the opening of the season to June 1, amounted to 7,642,773 tons, more than double the 1909 shipments and considerably in excess of those for 1907. Coal traffic figures tell the same tale, the shipments for May 1910 being 65 per cent above those for May 1909.

LOS ANGELES is hoping to have Mr. Roosevelt for a guest during the meeting of the American Mining Congress, a hope which will be shared by the whole West. Mr. Gifford Pinchot and Mr. James R. Garfield, of the famous tennis cabinet, have already promised to attend prepared to defend the conservation policies, but if Mr. Roosevelt himself can be induced to come the convention is likely not only to be interesting and influential, as is already assured, but of large historical importance. It is becoming clearer every day that some hard fighting must be done before a really effective constructive program relating to the public lands can be carried through and the sooner each side be compelled to submit its claims to open criticism the better. The meeting of the Mining Congress will afford a particularly appropriate occasion for such a debate.

TUNNEL driving methods are of perennial interest. In the *Engineering Record* of June 25 details are given regarding progress and methods in connection with the new Buffalo water works tunnel. The work here differed from that in mines in that it was done under compressed air owing to danger of influx of water. The rocks were sedimentary, flint, limestones, and shale, but in many particulars the conditions were not so dissimilar as to preclude comparison with mining tunnels. Of especial interest is the fact that when a change was made from one to three drilling crews per day the progress was increased 100 feet per month over the average for the preceding

twelve months, and 90 feet over the average for six. This was accomplished at an increased cost for labor and materials of less than $2000 per month and with practically no increase in general expense. A 96 per cent explosive was tried without any satisfactory increase in efficiency over the lower-grade dynamite. The bonus system of payment was used with negroes for drill runners and helpers, and Poles for other labor. Progress in March 1910 was at the rate of 390 feet per month.

TANAMI is the name of a new gold district now attracting attention and mentioned in our Melbourne letter this week. It is situated in the southwest part of the Northern Territory of Australia, a desert country in which prospecting has been carried on heretofore under great difficulties. The South Australian officials having found water by drilling and it having been discovered that the desert *spinifex* affords good pasturage, conditions have greatly improved. Gold has been found at a number of points and if adequate transportation can be afforded it seems probable that important mines will be developed. The building of the proposed transcontinental railway line is like to show that the interior of Australia is at least as capable of development as our own Great Basin region, and if the States can be brought to some agreement whereby the Federal Government can build the line great benefit will doubtless result.

NOMENCLATURE is ever a field for dispute but agreement as to definitions so markedly smooths the way of progress that earnest effort is commendable. In this issue Mr. R. P. McLaughlin challenges our use of 'dry hole' for a well in which oil was not found and argues that the term should be restricted to wells in which there is no water. He suggests 'non-productive' as proper for the first mentioned usage. Dryness is, of course, the antithesis of wetness and refers to the state of being covered with or permeated by a moist or fluid substance. In strict usage, therefore, a dry hole would be one in which neither water nor oil, nor indeed any fluid, had been found. Where drilling is commonly done for water the term is currently applied to wells in which there is no appreciable amount of water. Where, however, drilling is for oil, it is used universally, so far as we know, for wells in which no oil or only a trace is found. The oil men have also the expressive term 'duster' for such a well. For wells in which a small quantity of oil, but not enough for commercial purposes has been found, the term 'non-productive' is in general use throughout the Appalachian and Middle West fields. In California where many men new to the oil business have gone into it, and where water is much scarcer than farther east, there is some confusion in usage. Just as when in Australia sailors took to mining and gave the name 'reef' to what miners had long known as veins, lodes, or 'ledges' so in California men used to thinking of wells or holes in the ground for the obtaining of water see confusion in using 'dry hole' for a well from which large quantities of that fluid are flowing. The oil man sees no difficulty in this and cheerfully applies to such a well the term 'water hole', quite oblivious of the long established usage of that term on the plains and the desert for an open pool or spring. The ways of the reformer are beset with difficulties and none realizes that so keenly as he who would lead all men to exactness in the use of words. This is possible in a science and in scientific discussion. It is rarely accomplished in an art, and at present oil production is far from having reached a scientific basis.

Land Withdrawal Law

Congress finally passed an Act giving the President specific authority to withdraw land from entry for various 'conservation' purposes. The bill as passed is quoted in full in our Washington letter of this week. It is substantially as framed by the Senate and differs in several important particulars from the bill first passed by the House. The modifications bring it into essential harmony with the demands made by California oil men and for this they are largely indebted to the public opinion aroused by the address of Mr. Curtis H. Lindley at the Bar Association of San Francisco, April 29; an address already noticed in these columns. In general the retroactive features of the House bill have been omitted though at the same time strict definition is given of the sort of work which is to be taken as entitling a claimant to recognition when land is withdrawn. It is further provided that the Act is not to be construed as a 'recognition, abridgment, or enlargement' of any asserted rights in cases of oil lands on which claims had been initiated after any previous withdrawal. Ample provision has been made for protection of claimants where actual development is under way. The President promptly issued orders re-withdrawing the land under the new law so that the only cases remaining to be adjudicated are those in which there is doubt as to the 'diligence' with which work 'leading to discovery of gas and oil' has been prosecuted. Probably a retroactive clause would not have held as against actual development, certainly it should not have done so, and since other claimants are shut out by the new withdrawal order the law may well be considered a satisfactory compromise. There will remain a number of individual cases to be adjusted but these will be much less numerous than in case either the amendments proposed in the House had been adopted, or a general retroactive clause placed in the law.

The important thing to remember, and there seems to be some danger that it will be overlooked, is that all these withdrawals are expressly stated to be temporary. They are merely for the purpose of preserving the present status until a satisfactory law governing the disposition of the lands in question be enacted. It is also true that if the Western people, who have the larger experience with, and more direct interest in the matter, can agree upon a satisfactory code, there is little probability of Congress refusing to enact it. If some of the time and energy expended in fighting the withdrawals had been devoted to perfecting the land laws, real progress would have been made more rapidly. It is not good to keep the land

locked up for development but it is equally bad that the old methods of disposition of the land should continue. It is violating no confidence to say that the attention of the Department of the Interior was first directed to the oil land situation in California by the numerous attempts at fraud in locating such lands as agricultural for gypsum or under some other pretense. The plain truth is that the oil placer law is and has been all the time so inadequate as to invite fraud. It was to secure a better law whether it provide for sale or lease, that the withdrawals were made. Later there has been some suggestion that a suitable fuel reserve for naval purposes be created but for any such use wholesale withdrawals would not have been needed. The point to be remembered is that the quickest way to secure a vacation of the withdrawal order is to co-operate in the formulation of a really adequate law. Incidentally it, in connection with an honest administration of the present law, is the best means of forestalling additional withdrawals or any attempt to make them applicable to lands containing metalliferous ores.

Bureau of Mines and the Geological Survey

'Bunkoed' was the widespread comment through the West when it was announced that the President had appointed Mr. George Otis Smith to be Acting Director of the Bureau of Mines. The judgment is probably too harsh and yet, with the highest respect for the efficient Director of the Geological Survey, it seems to have basis. Mr. Smith has been connected so intimately with the movement to prevent appointment of Mr. J. A. Holmes and to secure the position for Mr. E. W. Parker, that this is apparently but an indirect way to secure that which we understand was impossible directly, through the threatened refusal of the Senate to confirm Mr. Parker's appointment. For the President, under these conditions, to wait until Congress adjourned and then appoint Mr. Smith, is bound to create a bad impression. All this is said without the slightest wish to question the personal fitness for the place of either Mr. Parker or Mr. Smith. Both are administrators of proved ability and gentlemen of large attainments and high character. The objection to putting the work into the charge of either is that they are not in sympathy with what the majority of those interested in creating the Bureau of Mines expect the latter to do, and what, so far as we are concerned, we believe to be the proper functions of the Bureau. The members of the Geological Survey for years have feared that a Bureau of Mines would come, in popular and Congressional estimation, to stand for the practical as against a supposed merely scientific interest in mining matters on the part of the Geological Survey, and that this would be reflected in the growth of the Bureau at the expense of the Survey. It is well known that for years Survey officials refused to have anything to do with the movement for a Bureau of Mines and that their final attitude was one of acquiescence rather than of aggressive helpfulness. In this they have been fortified by unwise statements on the part of some of the advocates of the new Bureau. It is not true and has not been since the Geological Survey was created at least that the mining industry is not represented at Washington' but the reiteration of that phrase seems to have got on the nerves of the gentlemen of the Survey until they have been fairly 'seeing things at night.' They should have more confidence in their work and in the discrimination of the mining engineers and mining men, on whose opinion in last analysis they must depend for support. No responsible mining man wants to take any proper function from the Geological Survey and all wish it many years of usefulness and appropriations many times compounded, but mining men as well as others reserve the right to ask for any needed additional representation at Washington and the further right of opinion as to how present representation shall be allotted. To pass over to the Geological Survey not only the interpretation of its own functions but that of other coordinate bureaus, is not fair to the latter, nor is it good administration. We fear that the Director of the Geological Survey has precipitated, what we are sure he was most anxious to avoid, a contest between the Survey and the Bureau of Mines. He may temporarily control the situation, but in the nature of things such a condition can not last and the reaction is likely to be more severe than would have been the original action had the latter been met helpfully rather than in a spirit of antagonism.

Research and Technical Men

Co-operation between the research men of the schools and technical men in charge of mining and metallurgical plants is much to be desired. In this issue Mr. R. C. Benner, of the department of chemistry of the University of Arizona, makes a plea for closer relations and suggests one plan by which they may be brought about. Occasionally the metallurgist and engineer in actual practice can take his problem to the university laboratory but oftener the exigencies of time and place intervene. At Golden, Colorado, Mr. Victor Alderson, president of the School of Mines, has been building up a testing plant with the avowed purpose of placing it at the disposal of all properly qualified engineers who may have tests to make or metallurgical problems to solve. He has taken the ground that one such plant can operate more economically and can with the same investment be made much more complete than if each engineer attempted to maintain his own. At the same time, as observers and assistants, the students will get the best possible training under the severe limitations of actual working conditions. It is too soon to pass final judgment on the project but certainly there is much to commend in it. Possibly the new Bureau of Mines may find a means of extending hospitality to engineers and their problems in cases where ordinary laboratories are clearly inadequate. If so it will serve a useful purpose and bind closer the ties between mining men and what is expected to become an exceedingly helpful Bureau. Mr. Benner's contribution is timely and all other suggestions as to means for bringing about what everyone wants, will be widely welcomed.

Mr. Roosevelt at Oxford

By T. A. Rickard

On Tuesday, June 7, Mr. Theodore Roosevelt delivered the Romanes lecture at Oxford University. It is an event so significant and so interesting as to warrant description even in a technical journal. I was privileged to be present and enjoyed the episode from the point of view of an Englishman in sympathy with American ideas.

A week earlier Mr. Roosevelt had received the freedom of the City of London and no sooner had he been made a burgess than he exercised the right of citizenship by offering counsel to the British administrators in Egypt. It was a magnificent indiscretion but a friendly act. After a year spent in Africa, in four spheres of British rule, he was well fitted to give both intelligent praise and salutary warning. He was as generous in emphasizing the beneficence of the work we are doing in the Sudan, East Africa, and Uganda, as he was outspoken in condemning the Egyptian nationalists who "treat assassination as a corner-stone of government" and the officials who are timorous in extinguishing violence, for "of all broken reeds, sentimentality is the most broken reed on which righteousness can lean." Fortunately his criticisms were well received. Englishmen have a sense of humor, not too evident, but it does save the day occasionally. Moreover, the administration of Egypt is now under the control of a Liberal government, hence the Conservatives, with their daily press and their social influence, were tickled to hear strictures upon the policy of their opponents and amused to see Roosevelt, under Providence, embarrass those in authority. If the Government of the day had been Tory, the speech at the Guildhall would have proved less palatable, for instance, at Oxford, where the Chancellor, Lord Curzon, was able to refer to it approvingly and even gleefully.

The American ex-President himself was amused at the sensation caused by his speech in the city and did not scruple to refer to the "engaging frankness" of it. This was at the luncheon given in his honor by the American Club just before the Romanes lecture. The Club is composed of Rhodes scholars and other American students in residence at Oxford. The chairman was F. P. Griffiths, who made an admirable speech, in the course of which he dropped the particularly apt remark: "Good sermons are rare." He referred, of course, to the lay sermons on sociology delivered by the guest of the occasion. Mr. Roosevelt does indeed sermonize, but with what tremendous effect! Ordinarily the sermon in church is delivered by a man whose opinion on the weather we would scarcely value, but the preaching of Roosevelt is that of a man who has done things, a governor of men, a hunter of lions, a foe of corruption, and a prophet of good.

He responded to the chairman's speech and to the enthusiastic welcome of those present by making a few happy observations, chiefly in appreciation of the Rhodes gift and the hospitality of Oxford to American students. He speaks with extreme slowness, and clearly; he has a good voice, tending to hoarseness; he is emphatic, with an accent that a Britisher calls American and a Bostonian would term Philadelphian. When speaking he has neither the cultivated ease nor the oratorial charm that mark the best American speakers, but the slowness and distinctness of his utterance are decidedly impressive as evincing deliberate thought and strong conviction.

The Romanes lecture was founded twenty years ago by J. G. Romanes, a biologist, who desired to see instituted at Oxford a lectureship similar in kind to that of the Rede foundation at Cambridge. The founder insisted that the lecturers should be selected irrespective of nationality, and that neither politics nor religion should be made part of the subject matter. The first lecture was delivered by Gladstone in 1892, the second by Huxley in 1893, the third by Weismann. Last year the lecturer was Arthur J. Balfour. An honorarium of £25 is paid to each lecturer. Gladstone modestly called his address 'An Academic Sketch' but it culminated in a magnificent burst of eloquence and concluded with the words that are near every Oxford man's heart: *Dominus illuminatio mea.* The 'Evolution and Ethics' of Huxley was one of his finest expositions of the development of civilization amid the welter of the struggle for existence and it illustrated the illuminating quality of a highly trained scientific imagination when applied to the profoundest problems of existence. In many ways this lecture was a superb preface to Roosevelt's, although it would be unfair to compare the latter's treatment of his subject with that of the greatest expositor of the nineteenth century. Yet Huxley would have appreciated Roosevelt, for he, too, had an intensely virile strain; intellectually he repeatedly proved the possession of an essential manliness, strong to meet the blows of fate and circumstance, and a self-mastery as striking, and far more touching, than that of the colonel of Rough Riders. The last words of the second Romanes lecture were curiously in accord with Rooseveltian sentiment, for Huxley said:

"We are grown men, and must play the man strong in will,
To strive, to seek, to find, and not to yield,

> cherishing the good that falls in our way, and bearing the evil, in and around us, with stout hearts set on diminishing it. So far, we all may strive in one faith towards one hope:

It may be that the gulfs will wash us down,
It may be we shall touch the Happy Isles,
. . . . . but something ere the end,
Some work of noble note may yet be done."

Roosevelt at Oxford! The association of names provokes a contrast between the old and the new, between ideas and ideals so unlike that the difference excites humor, between the romantic and the practical, between thought and action. It was delicious to think of the Strenuous One lecturing the dons of the university, to hear the Rough Rider in the home of ecclesiastic romance, to see the ex-President of the United States facing the ex-Viceroy of India.

It happened to be a lovely summer day, smiling in sunshine, dropping the tear of a shower only to

freshen the wealth of flowers, shrubs and trees that softens the architectural beauty of the long line of noble colleges. "Beautiful city! so venerable, so lovely, so unravaged by the fierce intellectual life of our century, so serene!" No wonder Matthew Arnold wrote rapturously concerning "the home of lost causes and forsaken beliefs of unpopular names and impossible loyalties." Her mediaeval charm is as potent, nay more, in this restless era of telegraphs and telephones, of motorists and airmen, than fifty years ago when Arnold thus apostrophised her. She still "whispers the last enchantments of the Middle Ages," but she is no longer withdrawn from the flowing river of the nation's intellectual life; on the contrary, to Oxford largely is given the task to train the rulers of empire. She may not be an incubator for engineers nor a nursery for financiers, but preeminently it is her task to train the men who become pro-consuls and administrators, the just and wise rulers over those alien races that live in peace under the British flag. Selborne, Milner, and Curzon typify the Oxford product. The noble traditions, the philosophic teaching, the aristocratic *milieu*, the historic associations, the reality of greatness, all afford fit environment wherein to teach young Englishmen to act worthily as the representatives of a dominant race when exercising imperial sway, but it may well be questioned whether Oxford affords the atmosphere in which to educate the leaders of a democracy, even under the shelter of a limited monarchy. Of social snobbery there is none worth mentioning, the students take rank on their merits as men, they work and they play under ideal conditions; the bank balance does not count; they discover that life is good if you know how to live it; they are happy! The learning is disinterested, for no commercial purpose is in view; the play is not made a business, it is just enjoyed for itself. Oxford is not a training-ship nor a hot-house, youth learns to live and to think there. Her windows are Gothic but through them is seen the wide world of today.

The Romanes lecture is always delivered in the Sheldonian theatre, which was the first public building designed by Sir Christopher Wren, the architect of St. Paul's cathedral. In this university theatre the Duke of Wellington was installed as Chancellor, amid great enthusiasm, in 1833; here Disraeli declared: "I prefer to be on the side of the Angels." Here, in the previous century, Handel conducted the performance of his oratorio 'Athalia'. It is not a large structure and it was full to overflowing long before the proceedings began. The audience numbered about four thousand. In the galleries were the undergraduates, in the side aisles were such of the general public as had been fortunate enough to secure tickets, and the floor of the theatre was wholly occupied by graduates, wearing gowns with their distinctive hoods; the white ermine of the Bachelor of Arts and the magenta satin of the Master of Arts. Facing the entrance was the 'throne' of the Chancellor and below him were two curving tiers of seats left vacant for the learned doctors who would come in procession escorting the distinguished man about to be numbered with them.

At three o'clock the academic procession entered. Through the window I could see them leave the School of Divinity where they robed and where they had performed the formalities preliminary to conferring an honorary degree. They crossed the short space between the two buildings and entered the theatre led by the marshal followed by the bedels with their rods of office, the Chancellor of the University, Lord Curzon of Kedleston, the Vice-Chancellor, the Heads of Colleges, and then a long line of doctors in scarlet hoods, among whom I recognized Andrew Lang and Rudyard Kipling. The two representatives of Oxford in Parliament (Sir William Anson and Lord Hugh Cecil) had already taken their seats. The train of the gorgeous robes worn by the Chancellor was borne by a younger son of the Earl of Selborne, recently High Commissioner in South Africa.

The audience being technically seated, although hundreds stood for lack of accommodation, the Chancellor addressed the Convocation in Latin, asking them if it were their pleasure that the honorary degree of Doctor of Civil Law be conferred on "the Honorable Theodore Roosevelt, ex-President of the United States of North America, and that the long-expected Romanes lecture may be delivered by him, etc." Cries of '*placet*' followed. Whereupon the bedels were sent to bring the honorable gentleman, and the Chancellor turned to the Vice-Chancellor and said, in Latin, what can be freely translated thus:

"Behold, Vice-Chancellor, the promised wight
Before whose coming comets turned to flight,
And all the startled mouths of sevenfold Nile took fright!"

The audience laughed appreciatively, and as Mr. Roosevelt entered a mighty burst of applause greeted him. Walking to the foot of the steps leading to the Chancellor's chair, he halted, and was addressed (still in Latin) by Henry Goudy, the Regius Professor of Civil Law. In a felicitous speech, heard only by those that were near, the orator referred to the principal events of Roosevelt's life, especially how "with unrivaled energy and tenacity of purpose he had combined lofty ideals with a sincere devotion to the practical needs not only of his fellow countrymen, but of humanity at large." This presentation speech being ended, the Chancellor spoke; and at the first word there was a roar of laughter, for he said: "*Strenuissime, insignissime civium toto urbe terrae hodie agentium.*" And the Most Strenuous One enjoyed it, as he did the references that followed, especially the "*hominum domitor, beluarum ubique vastator.*" This short speech ended with the words that conferred the degree. The recipient allowed himself to be robed in a scarlet gown, and then shook hands with the Chancellor. The latter directed the bedels to conduct "the honorable Doctor to the lectern," whereupon Roosevelt, amid further applause, took his place, ready to begin the lecture.

Before he began, however, he had to listen to another speech, this time in English, by the Chancellor. Lord Curzon, a tall and imposing figure in gorgeous gilded robes, stood facing him. It was worth coming a long way to see these two men *vis à vis*, each playing a great part in an impressive performance.

Curzon spoke excellently, in cultivated accents, easily, with a touch of humor, an obvious friendliness, and with the superb confidence of a practised speaker addressing a chosen audience. The nobleman, the statesman, the ex-Viceroy of India paid his compliments to the citizen, the leader of the greatest democracy in history, the ex-President of the United States, and it must be confessed that the phrasing was worthy of both men. It thrilled me through and through that so fine an appreciation could be uttered, and yet be true. The Chancellor said that he had just had the pleasure of addressing Mr. Roosevelt in a language which, of course, he would recognize as the habitual medium of intellectual intercourse in the university to which they now both belonged. It now fell to him to say a few words of welcome to Dr. Roosevelt, in a language of which in its most picturesque and forcible idioms he was an acknowledged master. The invitation to deliver the Romanes lecture had served as a nucleus around which had been built "that wonderful progress of his through the countries of Europe, a triumphal progress such as had been enjoyed but by few even among conquerors and kings." He then went on to say: "And yet I doubt whether in all the countries he has visited Mr. Roosevelt has anywhere received a warmer welcome than that which has been given him in this ancient seat of learning, for we greet him not merely as a great ruler of men, the most conspicuous figure in America's history since Abraham Lincoln, not simply as a sincere and outspoken friend of his country, though from all his utterances we knew that he was, but also as a student of many forms of knowledge, a writer of books, a fearless preacher of robust and manly faith, a relentless foe of conventions and shams, and, above all things, in all that he says and does he is what Browning said of Clive, 'pre-eminently a man'."

It may be that the Chancellor was a trifle too facetious; at least some of the audience thought so, but I confess to having enjoyed his witty touches, because they gave relief to the general tone of handsome eulogy. It was a delightful speech, delivered perfectly.

All the while the subject of it stood quietly at the lectern, with his sheets of manuscript ready to read. An astonishingly young-looking man, not within ten years of his real age. A head covered with short thick ruddy brown hair and a stalwart figure, he looked anything but academic. The back of his head seemed that of a man in the thirties and belligerent in every line of it: not domed, but flat on top: it bespoke action rather than contemplation. Obviously he was in splendid health and brim-full of vitality. When Gladstone delivered the Romanes lecture he was 83, Huxley was 68, Roosevelt was 52. Such physical well-being is a great factor in the career of a political reformer. Roosevelt is pre-eminently the eupeptic hero of our day: May he outlive all his enemies.

When he began to deliver the lecture his accent was strongly marked. Perhaps a touch of nervousness affected his enunciation; as he proceeded this defect was less evident, although in some words the pronunciation was persistently provincial, by which I mean that he did not speak the English language as it is spoken by the most cultivated Americans, for instance, at his alma mater, Harvard. Whether life in the West or association with politicians in the East of America be the cause, the fact remains that Mr. Roosevelt speaks English with an accent no purer that that of many Britishers. However, this detail is not material. It was lost in the broad effect.

The subject was 'Biological Analogies in History'. He began with a graceful compliment to local associations and to memories that "are living realities in the minds of scores of thousands of men who have never seen" Oxford. Such associations, he said, "are no stronger in the men of English stock than in those who are not. My people have been for eight generations in America, but in one thing I am like the Americans of tomorrow rather than like the Americans of today, for I have in my veins the blood of men who came from many different European races." This reference to his own "ethnic make-up" and to that of his fellow countrymen was apt and enabled him to emphasize an understanding sympathy superior to biological antecedents. Loud applause punctuated the statement that ended the introduction when he said: "Common heirship in the things of the spirit makes a closer bond than common heirship in the things of the body."

Next he discoursed on the study of history, laying stress on the necessity for treating such a study not only as science but as literature. "We need a literature of science that shall not only be read but shall be readable." Many of those present must have thought of the great biologist who delivered the second Romanes lecture and who in the work of his life illustrated to perfection the application of literary treatment to scientific knowledge. I wondered why Roosevelt omitted the chance to refer to Huxley. He proceeded to point out that the proper study of mankind is man in a biological sense and that the historian must avail himself of "the science of evolution, which is inseparably connected with the great name of Darwin." He confessed himself as impressed by the parallelism between the cycles of animal life and those of national life. But not without a warning against false analogies. "As knowledge increases our wisdom is often turned into foolishness." Terms must be defined lest we fall into the error of hasty generalization. We talk of a "new species", yet no living thing can really belong to a new species. Similarly, the "extinction of species" may mean either of two things: that the species has literally died out; or that it has so changed as to be no longer recognizable.

Then followed a sketch of the biological history of South America. As soon as the southern continent became joined, by the elevation of the isthmus, with the northern regions, the animals of North America passed over the land bridge and invaded South America. A riot of life ensued. The conquering type developed enormous bulk and complete armor protection. The indigenous creatures that survived also grew in size and power according to their needs. Events such as these are matched in the history of man. Nations go under and disappear: others

survive and are regenerated into a 'new' nation, in which the remnants of the old are perpetuated.

In this first portion of his address Mr Roosevelt discussed fundamental biological principles without saying anything new. Remembering Huxley's lecture on 'Evolution and Ethics', remembering that in biology Roosevelt was the veriest amateur, I felt that he was on the edge of a fiasco, and the feeling oppressed me keenly. But when he got off this treacherous ground and began to touch on matters in which he could show clearer insight I realized that the early part of the lecture had the foundation for what was to follow. He drew analogies between the fate befalling the forms of animal life and the destiny of the great artificial civilization, such as Babylon and Nineveh, Greece and Rome. "The growth of soft luxury, after it has reached a certain point, becomes a national danger patent to all. If the homely commonplace virtues die out, if strength of character vanishes in graceful self-indulgence, then the nation has lost what no material prosperity can offset." There he struck a characteristic chord. Holland furnished another example. "Her fatal weakness was that so common in rich peace-loving societies, where men hate to think of war as possible, and try to justify their own reluctance to face it either by high-sounding moral platitudes or else by a philosophy of short-sighted materialism." But Holland and Italy taught us how races that fall may rise again. "When the Roman Empire went down in ruin, it was one of the greatest cataclysms of history, but it was not all mere destruction. Not only did Rome leave a vast heritage of language, culture, law, ideas to all the modern world, but the people of Italy kept the old blood as the chief strain in their veins. In a few centuries came a wonderful new birth of Italy." Italy rose and fell again, more than once. Spain and Portugal also had their day. "Their flowering time was as brief as it was wonderful. When the first brilliant period of the leadership of the Iberian peoples was drawing to a close, at the other end of Europe, in the land of the melancholy steppe and forest, the Slav turned in his troubled sleep and stretched out his hand to grasp dominion."

The memories of men are short and the supremacy of races is brief. "More than a century passed after the voyages of Columbus before the mastery of war began to pass from the Asiatic to the European." Then "the European advance gathered momentum, until at the present time peoples of European blood hold dominion over all America and Australia and the islands of the sea, over most of Africa, and the major half of Asia." The various nations of Europe in turn sought "a place in the movement of expansion, but for the last three centuries the great phenomenon of mankind has been the growth of the English-speaking peoples and their spread over the world's waste spaces."

Here he entered the third phase of the lecture; he now held the sympathy of his audience and frequent applause punctuated his speech. Unfortunately so much time had been given to the preliminaries and to his own introductory observations that, realizing the inadequacy of time, he began to discard sheets of typewritten manuscript without reading them. As the newspapers had received advance copies of the lecture several weeks earlier, the reporters had an easy task and the frequent rustling of leaves as they followed his utterances indicated the omission of long paragraphs. Another result followed for the evening papers, and even some of those appearing next morning, quoted portions of the lecture omitted by the lecturer and offered comment on matters of which he had not spoken. He held the sheets in his left hand and used his right for an occasional gesture, raising his hand with the index finger erect to emphasize a point. But there were not oratorical flourishes, he spoke as a man careless of everything except the desire to convince.

Thus he came to the comparison between Britain and Rome, and between the British empire and the American democracy. "England has peopled continents with her children, has swayed the destinies of teeming myriads of alien races, has ruled ancient monarchies, and wrested from all comers the right to the world's waste spaces, while at home she has held her own before nations each of military power comparable to Rome at her zenith." Rome fell by attack from without, because of domestic ills. He pushed the analogy: "We should be vigilant against foes from without, yet we need never really fear them so long as we safeguard ourselves against the enemies within our own households; and those enemies are our own passions and follies." Americans and Englishmen alike must keep in mind that the success of a great democracy depends on self-knowledge and self-mastery. "In the last analysis the all-important factor in national greatness is national character." What was to be our destiny? Were we as nations soon "to come under the rule of that great law of death which is itself but part of the law of life." None could tell. The growth of luxury, the love of ease, the taste for vapid and frivolous excitement were both evident and unhealthy. The ominous sign was the decline in the birth-rate. But "no man is more apt to be mistaken than the prophet of evil." It was "strange indeed to look back at Carlyle's prophecies, and then think of the teeming life of achievement, the life of conquest of every kind, and of noble effort crowned by success which has been ours for the two generations since Carlyle complained to High Heaven that all the tales had been told and all the songs sung, and that all the deeds really worth doing had been done." Come what might we belonged to people "who have not yielded to the craven fear of being great." Moreover, while freely admitting all the follies and weaknesses of our day, it is yet mere perversity to refuse to realize the incredible advance that has been made in ethical standards. He was no pessimist. He had scant patience with "the silly cynicism which insisted that kindliness of character only accompanies weakness of character." On the contrary, he held that "rugged strength and courage would go hand in hand with a lofty scorn of doing wrong to others." Each nation had problems of its own and must solve them in its own fashion, in a spirit of broad humanity, free from weakness and sentimentality. "As in war to pardon the coward

was to do cruel wrong to the brave man whose life his cowardice jeopardized, so in civil affairs it was revolting to every principle of justice to give to the lazy, the vicious, or even the feeble or dull-witted, a reward which was really the robbery of what braver, wiser, abler men had earned." In dealing with social problems "the one prime necessity was to remember that though hardness of heart is a great evil, it is no greater an evil than softness of head." Each man was entitled to be treated on his worth as a man. "To more than such just treatment no man is entitled, and less than such just treatment no man should receive." Thus he harped on that noble string from which the American makes the sweetest music known to humanity.

He spoke at length in this strain and I select from his concluding remarks the following sentences: "The only effective way to help any man is to help him to help himself; and the worst lesson to teach him is that he can be permanently helped at the expense of some one else. True liberty shows itself to best advantage in protecting the rights of others, and especially of minorities. Privilege should not be tolerated because it is to the advantage of a minority; nor yet because it is to the advantage of a majority. No doctrinaire theories of vested rights or freedom of contract can stand in the way of cutting out abuses from the body politic. Just as little can we afford to follow the doctrinaires of an impossible—and incidentally of a highly undesirable—social revolution, which in destroying individual rights—including property rights—and the family would destroy the two chief agents in the advance of mankind, and the two chief reasons why either the advance or the preservation of mankind is worth while."

When he finished, the theatre resounded with hearty applause. The audience had listened with the closest attention; contrary to precedent, even the undergraduates in the gallery had forborn to chaff; it was evident that the academic gathering was deeply touched, sympathetically appreciative, and finally heartily enthusiastic. In its strong points, as in its weak ones; in its general tone of outspoken virility, unsophisticated reasoning, and cheerful optimism, the lecture was representative of the lay sermonizing for which the lecturer is now famous. He spoke as one who reads the classics in the intervals of lion-hunting, and studies history while fighting monopolies. He is as downright as he is upright, as broad in his ideas as he is deep in his convictions. It may be that his sayings do no apply the stimulus of novelty to a cultivated mind, but the same may be said of many lectures delivered at Oxford, and elsewhere. He makes plain things obvious and gives a new life to platitudes. He dresses the eternal verities in the garments of his own manly sincerity so that they seem endowed with the freshness of a new day instead of the staleness of forgotten ideas. He came to Oxford a man on horseback, a Rough Rider in a cathedral, a practical man among scholars, a radical among reactionaries, but he left it vibrating to the glad optimism, sound common-sense, and inspiring invocation of his thoughtful utterances. He forged another golden link between the two English-speaking peoples and proved indeed that "common heirship in the things of the spirit makes a closer bond than common heirship in the things of the body."

PACIFIC NORTHWEST SOCIETY OF ENGINEERS

The eighth annual convention of this society was opened in Seattle, Washington, on Thursday morning, June 16. The business included the annual address by the president, H. Day Hanford; a paper by C. C. Ward, City Engineer, Wenatchee, Washington, on 'Irrigation Development in Wenatchee Valley'; one by Major C. W. Kutz, U. S. Engineer, on 'Seacoast Defences'; and a full discussion of the proposed law providing for licensing engineers practicing in the State of Washington. The committee in charge of the last-mentioned subject, with Capt. A. O. Powell as chairman, was continued, with instructions to report progress in September; also to take up the subject of water rights and conservation in Washington. On Friday morning an excursion was made by steamer to Irondale, near Port Townsend, Puget Sound, to inspect the iron and steel-making plant of the Western Steel Corporation, at which in May the manufacture of steel was begun, using pig iron from China, scrap iron, and local iron ores. In the afternoon Fort Worden was visited, and there the working of the torpedo-firing plant and submarine mines was explained, and target practice with 12-in. mortars and 6-in. guns was witnessed.

The Shannon Copper Co., through an agreement with the railroads, of which the Interstate Commerce Commission has approved, has obtained a reduced rate on all its supplies, such as coke, oil, and lumber, which will effect a saving to the company of from $35,000 to $40,000 per annum. This new rate is to take effect immediately. A saving is also being made of about $5000 per month through the operation of the new Shannon-Arizona railroad, which carries the Shannon ores to the smelter at Clifton. A profit of $8000 or $10,000 a year is also expected from the company's new water system. The importance of these items, totaling around $100,000 per year, will be better appreciated when it is remembered that Shannon's total earnings for the year ended August 31, 1909, were $84,000. In other words, Shannon is making a saving through new operating economies recently carried into effect which should more than duplicate the profits for the last fiscal year. The full effect of these economies will not be reflected in the earnings for the present fiscal year, but they will be an important factor. Shannon is producing about 17,000,000 lb. of copper per annum and at a lower cost than ever before. The company has recently opened some high-grade orebodies on the lower levels, where active mining will soon commence.—*Boston News Bureau.*

In high-voltage transmission lines the standard practice is to erect seven or eight towers per mile at an approximate cost of $500 per tower. This includes material and construction, but does not take into consideration right of way and wires.

Bucket Scraper for Use in Placer Mining

The accompanying pictures illustrate the work of a bucket scraper used by C. W. Purington at the Kolchar [illegible] in East Siberia. The pictures tell the tale so well that few words are needed. The machine is capable of digging a pit 120 ft. wide and 27 deep. It handled 1700 cu. yd. per day when working full time, and made an actual average of 593 yd. for 59 days including all stops. The material handled was old tailing which was delivered to a sluice supplied with water by means of centrifugal pumps. The dirt makes its own hopper and the whole arrangement is very simple and flexible. Operating costs under the adverse conditions obtaining at Kolchan were about 30c per yd. This included the high wages of an engineer and mechanic taken from Chicago to erect and start the machine. The advantages of the bucket scraper are that it permits preliminary work at low first cost in out of the way places long before a dredge could be installed or even before sufficient data would be available to warrant building a dredge. In this case the machine was bought in Chicago in April and enough dirt was handled to show a profit on the season's work before October. This year it is to be used in connection with a scow carrying the gold-saving tables usually placed on a dredge.

The Beginning of the Use of Natural Gas for Fuel

By John L. Cowan

It is said that J. M. Guffey, the Pittsburg oil operator, expended more than a million dollars in vain endeavors to develop in California an adequate supply of natural gas to justify the application of this ideal fuel to manufacturing purposes on a large scale. His repeated failures, and the nature of the formations found in the majority of his numberless test wells, convinced him that the overlying strata, above the oil and gas sands, were not sufficiently compact to retain so volatile a medium, at high pressure. Consequently, it has long been regarded as settled that California would never have gasfields at all comparable with those of Pennsylvania, West Virginia, and Indiana. However, the great gas wells recently struck in the Buena Vista hills, in the Bakersfield district, have changed the natural-gas situation and outlook. One of these wells is estimated to be producing at the rate of 11,000,000 cu. ft. of gas per day, and another is said to produce 16,000,000. Granting that these estimates are exaggerated, it is certain that both are great wells; and that further exploration will result in the finding of many more as large or larger is probable. In the Pittsburg manufacturing district, gas is piped for hundreds of miles, so that the development of an important natural-gas field in the Bakersfield district would almost certainly result in the laying of pipe-lines to San Francisco. What this would mean to the manufacturing industries of the Bay cities, and, in fact, of the whole State, is easily seen. There is no manufacturing purpose for which this fuel is not superior to coal, oil, or any other fuel known. The possibility, then, that the ideal fuel may soon cut an important figure in the industrial development of the Pacific Coast appears to give a timely interest to some ancient but little known history.

Like many other good things, natural gas, although known for centuries, was first turned to practical account in the United States. The Chinese claim to have conveyed it through bamboo pipes and to have used it for heating and lighting thousands of years ago. The Parsees or Fire-worshippers, burned it in their temple at Baku, and regarded it as an everlasting miracle attesting the truth of their religion. And it is believed by many modern investigators that the tripod of the Delphic oracle was placed over a vent or fissure, from which issued natural gas, the fumes of which caused the mysterious' frenzy' of the oracle, giving solemnity and an appearance of supernatural influence to the ambiguous utterances of the most famous soothsayer of all time. In spite of these ancient uses or misuses, it must be admitted that natural gas remained little more than a curiosity until in comparatively recent years, and that its value was first appreciated and an intelligent search first made for commercially important supplies in our own country. As was the case with petroleum, West Virginia and Pennsylvania share the honors of discovery and utillzation.

One of the earliest notices of the existence of natural gas in America comes from General Washington. In 1775, he visited a 'burning spring' on the Great Kanawaha river, nine miles above Charleston. The spring was simply a hole in the ground, which was generally partly filled with surface water, draining in after rains. Through the water, gas forced its way, keeping it in constant ebullition as if boiling. When ignited the gas blazed up to a height of several feet. The land on which the spring was located was pre-empted by Washington, along with other tracts given him by the colony of Virginia in return for military services. In his will he bequeathed one acre of land, with this burning spring in the centre, to the public forever, making the following reference to its acquisition: "The tract, of which the 123 acres is a moiety, was taken up by Gen. Andrew Lewis and myself for and on account of a bituminous spring which it contains, of so inflammable a nature as to burst forth as freely as spirits, and is nearly as difficult to extinguish." This burning spring was for many years regarded as one of the greatest natural wonders of the country. People traveled miles to visit it, and scientists of that day indulged in much learned speculation and discussion as to the origin of the escaping gas.

Similar phenomena were later discovered near the Little Kanawha river, and attracted an equal amount of attention. Forty-one miles above the mouth of the river is a little creek, known as 'Burning Spring creek'. Half a mile from the point where the creek flows into the river were the two springs that gave it name. From one of these, known as the Big Spring, the gas emerged in such quantities that, when set on fire, the flames covered an area of eight or ten square feet, and blazed up to a height of five or six feet. When ignited this spring would burn for months, until extinguished by a storm or wind of unusual severity. Similar burning springs were discovered from time to time in various parts of Western Virginia and Pennsylvania, and one near Niagara Falls, in New York. However, these were simply curiosities and objects of wonder. The first discovery of gas in sufficient quantities to tempt men to try to put it to use was purely an accident, incidental to the drilling of a salt well.

In 1815 a salt well was put down by Capt. James Wilson, within the present city limits of Charleston, West Virginia. The Captain was disappointed in both the quality and the quantity of the brine secured, and declared that he would get more and better salt water, or bore the well clear down to h—l. Shortly after this profane declaration, the drillers encountered a heavy flow of salt water and gas—the first natural gas ever struck in a well drilled by human agency. The gas caught fire and burned to a great height, to the great alarm and consternation of everyone in the neighborhood. Possibly thinking that he had certainly reached the destination announced, the doughty captain drilled no deeper, abandoning the well as worthless. This first of all gas wells was situated on land now included in a lease of the Charleston Gas Light Co. This was by no means the only salt well in the Kanawha valley in which gas was struck. In fact there were scores

of them but not until 1843 does it appear to have occurred to anyone to put it to work. In that year William Tompkins put down a salt well a short distance above Washington's burning spring and secured a large flow of salt water accompanied by gas. The gas was confined by means of an inverted kettle, piped off to the furnace and employed for boiling the brine, effecting a great saving in both fuel and labor. Two years later Dickson and Shrewsbury put down a well a short distance from the one belonging to Tompkins, tapping at a depth of about 1000 ft. the great gas reservoir of West Virginia, which is today so important a factor in promoting the industrial greatness of the Pittsburg manufacturing district. So great was the pressure that the tools, weighing about 1000 lb., were shot up from the well, followed by a column of salt water reported to be fully 150 ft. high. The roaring of the gas could be heard for miles. No doubt this well was small in comparison with some of the deep-sand 'gassers' of later days, but nothing like it had ever before been known in the world's history. It is, therefore, not strange that it created a profound impression, giving an idea of unseen forces of nature, and formerly undreamed of possibilities beneath the crust of this solid old earth.

The great gas well blowing a huge column of salt water high into the air was considered worth traveling long distances to see. A stage route passed near by, and it was the custom of the drivers to stop their teams and permit passengers to view the wonderful display. An amusing incident is related in this connection, by J. P. Hale, formerly president of the West Virginia Historical Society. He tells that a Harvard college professor was once traveling over this stage route; and, being of an investigating turn of mind, anxious to contribute his mite to the sum total of scientific knewledge, he went close up to the well and struck a light, to see whether the current report that the stuff would burn was true or not. It is unnecessary to say that the professor's doubts were quickly settled. It burned! The woodwork about the well was destroyed; the professor's hair and clothing were set on fire, and he only saved himself from cremation by jumping into the river. He was then taken to Charleston, where he was placed in the care of a physician for repairs.

The fire was finally extinguished, and the gas and salt water conveyed through pipes to the furnaces, where both were utilized. For a number of years the natural pressure of the gas lifted the salt water to the top of the well, forced it more than a mile through pipes to the salt furnaces, boiled the brine in the kettles, and supplied heat and light for the entire plant. I cannot help thinking that one of the owners was a little hard to please, when he remarked that the arrangement would be perfect if only the gas could be made to lift the salt from the kettles and pack it in barrels. The remarkable success of this well induced many other salt manufacturers of the Kanawha valley to drill deep wells in search of gas; and prior to the year 1850 Worth & English, Tompkins, Welsh & Co., William D. Shrewsbury, J. H. Fry, J. S. O. Brooks, and a number of others were using this fuel exclusively in salt manufacture.

The first use of natural gas for heating and lighting of buildings appears to have been made at Fredonia, New York. In 1821 it was discovered that gas was escaping from a spring near the town, and it was piped to a mill and several stores, which it supplied with light. It was also introduced into the public buildings, and was considered a wonder of sufficient importance to be shown to General Lafayette, when he passed through the village in 1824. A few years later a shaft was dug, and enough gas secured to supply 30 burners. In 1858 another shaft was sunk and two wells were drilled, one to a depth of 150 ft., securing a total supply of 2000 cu. ft. per day, which was consumed in the village, mainly for lighting purposes. The first general application of gas to domestic purposes, including cooking, lighting and heating, was in the Pennsylvania oil fields. After the oil excitement attained considerable proportions, many drillers and pumpers made a practice of piping the escaping gas to their shanties, and using it for cooking their victuals and lighting their rooms. The first town to be piped and to make general use of this fuel was Fairview, in Butler county, Pennsylvania, in the year 1870. The experiment proved so successful that Fairview's example was soon followed by Petrolia, Karns City, Argyle, and Parker City, all in the great oil belt of Western Pennsylvania.

It was later, in 1870 or 1871, that the new fuel was first used in iron manufacture at the iron works of the Great Western Iron Co. (of which Samuel J. Tilden was one of the principal owners), at Brody's Bend, on the Allegheny river; and shortly thereafter in the iron works at Leechburg. From that time forward its use became general, wherever the oil operator happened to find gas. However, it was not until in 1884 that the gas industry proper can be said to have come into existence with the laying of pipe-lines into Pittsburg. By 1885 the Consolidated Fuel Gas Co., and the Penn Fuel Co., were delivering from the Murrysville field about 10,000,000 cu. ft. of gas per day in Pittsburg. The Washington Gas Co. had laid a line 20 miles long from the famous McGuigan well in Washington county; and the Philadelphia Company had begun the construction of its first three big lines, one from Murraysville, one from Tarentum, and one from the Homewood wells. All these seemed like great developments, in those days, but they now appear small and insignificant. Many gas companies have main lines hundreds of miles in length, with smaller branches and feeders aggregating thousands of miles long, great pumping stations for forcing the gas long distances, field forces of thousands of men, leases covering hundreds of thousands of acres, and thousands of producing gas wells. Tens of thousands of families use gas exclusively for all domestic purposes, and scores of iron and steel, glass, stoneware, clayworking, and other manufacturing plants depend upon it for all industrial uses. Whether these enormous developments will ever be remotely approximated in California remains to be seen. The situation in California today, however, is practically the same as it was in Pennslyvania in the early eighties, when the Murraysville gas field first began to attract the attention of capitalists.

Faulting in the Bullfrog District, Nevada

By W. H. Emmons and G. H. Garrey

*In the Bullfrog district the tilting of the lavas occurred before or after they were faulted, or else the two processes went on together. Tilting before faulting is represented diagrammatically by Fig. 4; where an originally horizontal flow *ab* is tilted through 27° to *ad* and then faulted to *cd*. If it is assumed that tilting occurred before faulting, then rhyolite No. 7 (along the plane of section shown in Fig. 3) after tilting should have been 13,000 ft. lower at the east end of the 33,600-ft. section of rhyolite No. 7 than the same bed was at the west end. If the period between the deformation by the two processes were long enough for any considerable erosion, evidence of such relief should be preserved in this or adjacent districts in the form of a thick accumulation of derived sediments. These sedimentary rocks would now be faulted but not tilted. There is, of course, the possibility that nearly horizontal faulted sedimentary rocks of later age than the lavas do occur below the desert flats and that beds of the same age have been eroded from the higher country; but if all of the faulting had followed all of the tilting, with erosion and deposition between, the chances would have been good for the preservation of remnants of horizontal sedimentary beds, since faulting alone has caused displacement of more than a mile and without active simultaneous erosion must have produced that much relief. The absence of faulted but untilted rocks of later age than the lavas points toward the conclusion that the lavas were not tilted very long before they were faulted.

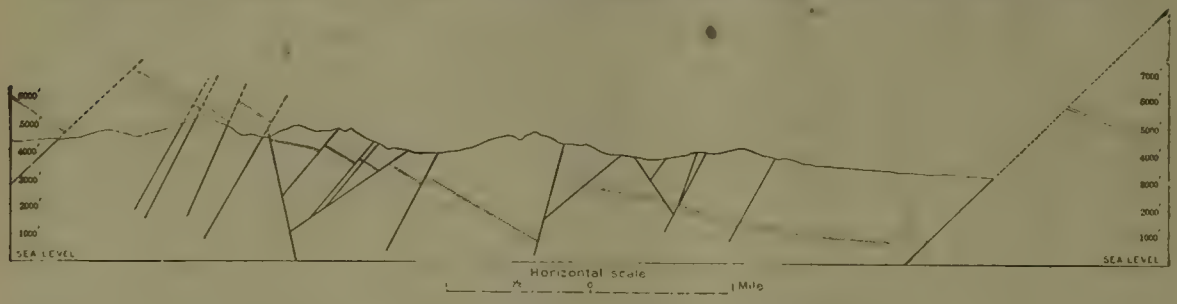


Fig. 3. Diagram illustrating displacement by fault lines at Bullfrog.

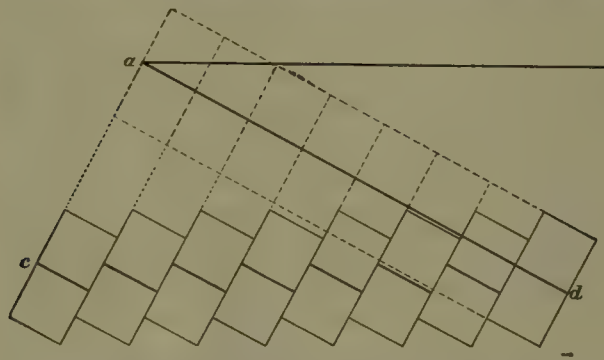


Fig. 4. Diagram illustrating tilting before faulting; vertical section at right angles to the strike of the faults. The original horizontal flow *ab* is tilted to *ad* and then faulted to *cd*.

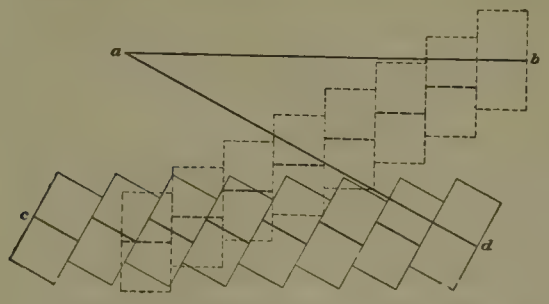


Fig. 5. Diagram illustrating faulting before tilting; vertical section at right angles to the strike of the faults. The original flow is faulted with downthrow to the left and the series of blocks as a whole is then tilted to the position *cd*.

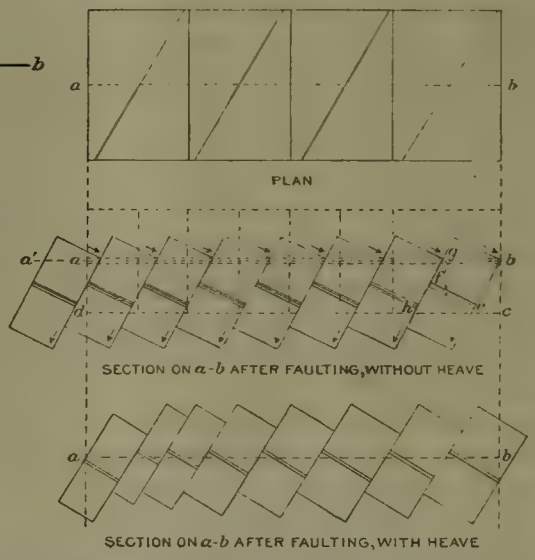


Fig. 6. Diagram illustrating simultaneous faulting and tilting. See text for explanation.

Faulting before tilting is represented diagrammatically in Fig. 5, where the bed *ab* is faulted with downthrow to the west, the segments taking the position shown by the dotted lines. If the series is tilted 27° with *b* as an axis, these blocks take the position of the solid lines. If all of the tilting shown in Fig. 3 had occurred after all of the displacement by faulting, then there should have been a very great relief before tilting, for faulting, as expressed in this

*Abstract from Bull. 407, U. S. Geol. Survey. Continued from Mining and Scientific Press, p. 931, June 25.

section, depressed the rocks 11,250 ft. If erosion had taken place between the operation of the two processes unless it were vigorous enough to carry all of the detrital material entirely beyond the area examined, the debris should now form tilted sedimentary rocks not faulted and some remnants of such rocks would very probably remain at some place within or near the area. Although at many places the beds on different sides of a fault dip at different angles, there is very little variation of dip within single blocks. This fact further suggests the interdependence and contemporaneity of the faulting and tilting. The short geologic time which has elapsed since the beginning of the deformation of the lavas by faulting and tilting suggests further that the two processes were nearly if not quite contemporaneous.

If faulting and tilting went on together, the effect would be that of rotation, each block moving more or less independently of adjoining blocks. Such movement is represented diagrammatically in Fig. 6, where the flow *ab* is cut by regularly spaced vertical fissures and the blocks are rotated independently without any tilting of the mass as a whole. As shown in this figure the horizontal distance through the blocks along the line *a'-b* is about 12% greater after rotation than before, and in consequence the area of the horizontal section through *a'-b* is likewise increased 12%, providing the width of the faulted area remains the same. If rotation occurred without extension along the line *a'-b* then there must have been a great horizontal movement or heave of the blocks along the fault planes while they were faulting. As shown in plan in the upper portion of this diagram, the faults cross one another, making angles of about 35°. This forms wedges, some of which present sharp edges to the plane of the section. If during deformation some of these wedges moved broad-part forward (at right angles to the line of the section) there would be room for the remaining blocks to settle without such great extension along the plane of the section. This horizontal element of movement along the faults of the Bullfrog district is recorded by inclined striae on fault planes.

The striations on the slickensided surfaces of the faults in the Bullfrog area make angles that vary from a fraction of a degree to 90° and have an average pitch of about 60°. Consequently the movement must have had a considerable horizontal component. Observations of recent faulting in California show that horizontal movement may be very important and that in some cases there seems to have been little vertical movement. Fig. 7 shows beds that have been tilted and that are cut by a fissure of which the dip is opposed to that of the beds. The strike of the fissure makes an acute angle with the strike of the beds. The left half of the block is shown to move horizontally toward the reader. This results in an apparent normal displacement that, when seen only in cross section, appears to have been straight up or down the plane of the fault. This effect is not produced when the beds are flat or when the strike of the fault is parallel to the strike of the beds, provided the movement is entirely horizontal; but the vertical displacement and horizontal displacement increase as the angle between the strike of the fault and the strike of the beds increases and are greatest when this angle is 90°. As shown in Fig. 7 there is, after faulting, an overlap of strata in the plan and a gap in cross section. If the left half, on the other hand, had moved in a horizontal direction away from the reader (see Fig. 8) the result would be an apparent reverse fault, or one in which the foot wall appears to have dropped with respect to the hanging wall. There is a gap in plan and an overlap in vertical section. With sufficient horizontal movement in the proper direction, such an apparent reverse fault might result even when some of the movement of the hanging wall was down the dip of the fault plane.

A study of the Bullfrog area shows that most of the offsets of strata due to faulting are such as could be produced by movement of the hanging wall side down the dip, without horizontal displacement or heave. But nearly everywhere there is an offset with an overlap instead of a gap. This shows that the horizontal element of movement of the blocks, however great it may have been, was in the direction which increased the apparent vertical displacement, or else its offsetting effect on the tilted beds was less than that caused by vertical movement, for if it had been greater and in an opposite direction a gap would have resulted where the relations of beds to fault planes are like those shown in Fig. 8, and the fault, as shown in vertical sections, would have been reverse. Since in the Bullfrog district no clearly reverse faults are shown and since there are no gaps on the surface such as would indicate them, it seems very probable that forces causing horizontal movement always operated in one direction, and so as to increase the apparent displacement. As already stated the directions of striae observed, taken all together, show that, in the movement recorded, the vertical component was greater than the horizontal component.

It is generally recognized that crustal shortening accompanies folding of strata. If a horizontal bed is tilted, without faulting, either it must be stretched or the rocks below must move or be compressed to meet the new conditions. The jointing of the rocks in the Bullfrog district shows that there has been some stretching, though certainly it is insufficient to meet the demands required by any considerable crustal shortening. On the other hand, tensional stress is commonly regarded as a condition for normal faulting and this appears to be necessary if the blocks move downward freely without crumpling the strata. If the various sections of rhyolite No. 7, as represented in Fig. 3, were horizontal and placed end to end, the resulting section would be 33,600 ft. long. The horizontal distance over which the small sections are now distributed is 42,240 ft. The difference is 8640 ft., or 25.6% of 33,600, which, for the whole section, represents the apparent net crustal extension due to faulting and tilting. That horizontal displacement with gap, as shown in vertical section, does not always represent real extension of the earth's surface is apparent from inspection of Fig. 7, where both cross sections A-B and C-D show

gaps, while the plan ABCD shows an overlap. The movement represented has been along the strike of the fault, and while the area itself has been unchanged, the disposition of the surfaces of the individual blocks is different. Yet as seen in vertical cross sections A–B and C–D the faulting has resulted in horizontal displacement with gap. However, this extension is only apparent, for, as seen in plan, it is compensated by the offset with overlap. All three dimensions, length, breadth, and thickness, should be considered in the discussion of the problem. As there has been no appreciable change of density in the material of the rocks in consequence of deformation, it is evident that the thickness of a faulted block must decrease if the length or breadth increases. Part of the overlap shown in the map of the Bullfrog area may be regarded as the expression of the shortening in this vertical direction, as shown diagrammatically in Fig. 7. From an inspection of the diagrams above referred to, it appears that the whole truth is not to be gained by measurements of distances between points of separation of beds in a few cross sections. The operation serves to indicate the kind of effects produced, but it is not accurately quantitative. It shows only that extension has taken place along the line of section; it does not show how much of this is due to horizontal movements (heave) in the directions of strike of the faults. As already stated, the horizontal component of the movement is less, on the average, than the vertical component in those faults where the direction of movement is recorded by striae. It is estimated that about one-third of the apparent crustal extension shown in Fig. 3 is due to horizontal displacement of blocks along the strike of fault-planes by movement that does not effect a change of area, but only a change in position of certain blocks. In accordance with this estimate the extension of the surface approximately at right angles to the strike of the faults would be two-thirds of the 25.6% extension calculated from that shown in Fig. 3, or about 16%. Further, if the individual blocks retain their shapes and dimensions, it is evident that the combination of tilting and inclined faulting does not extend the area in a direction parallel to the strike of the faults, but only in a direction at right angles to this. If all the faults were strictly parallel, the areal extension would be the same as the linear extension in a direction at right angles to the faults. No correction for heave would be necessary and the general section of Fig. 3 would show directly an extension of about 16%. In other words, an area of 1 square mile would be, after faulting and tilting, 1.16 square miles.

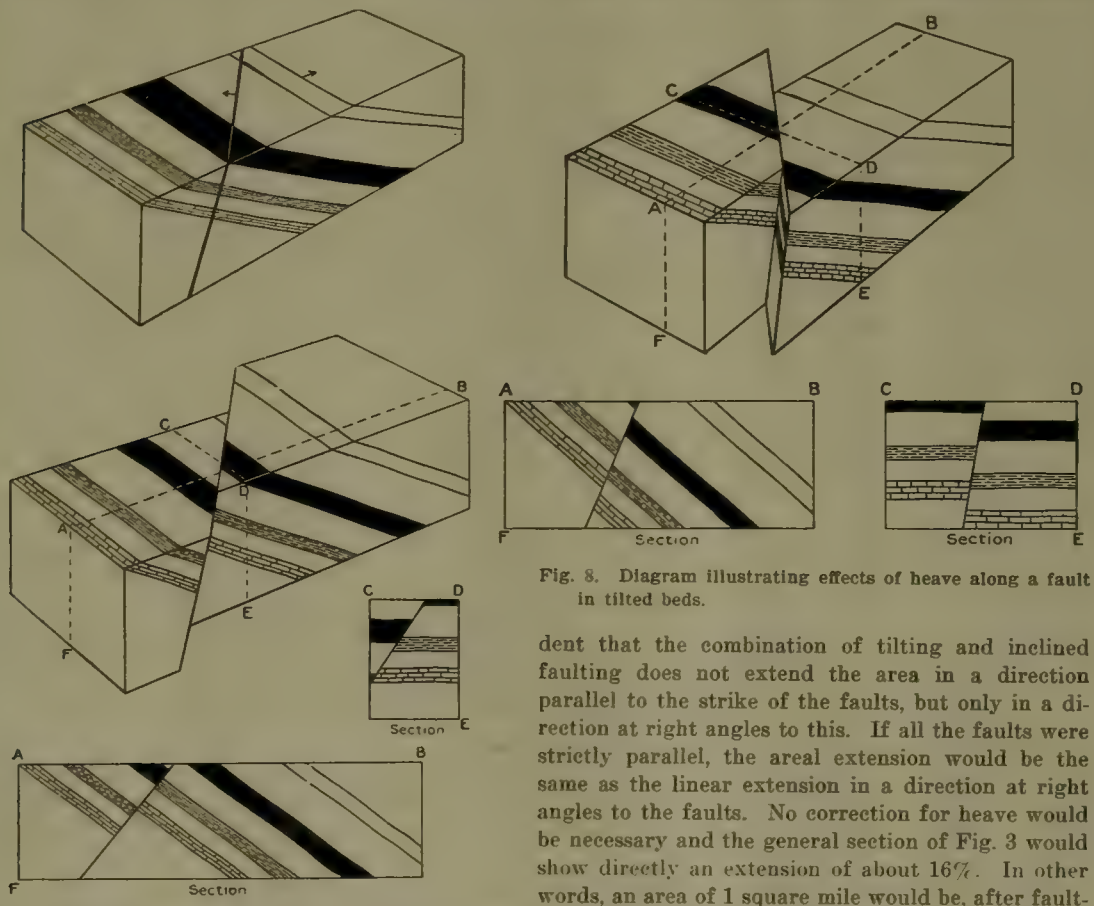


Fig. 7. Diagram illustrating some of the effects of heave along a fault in tilted beds. See text for explanation.

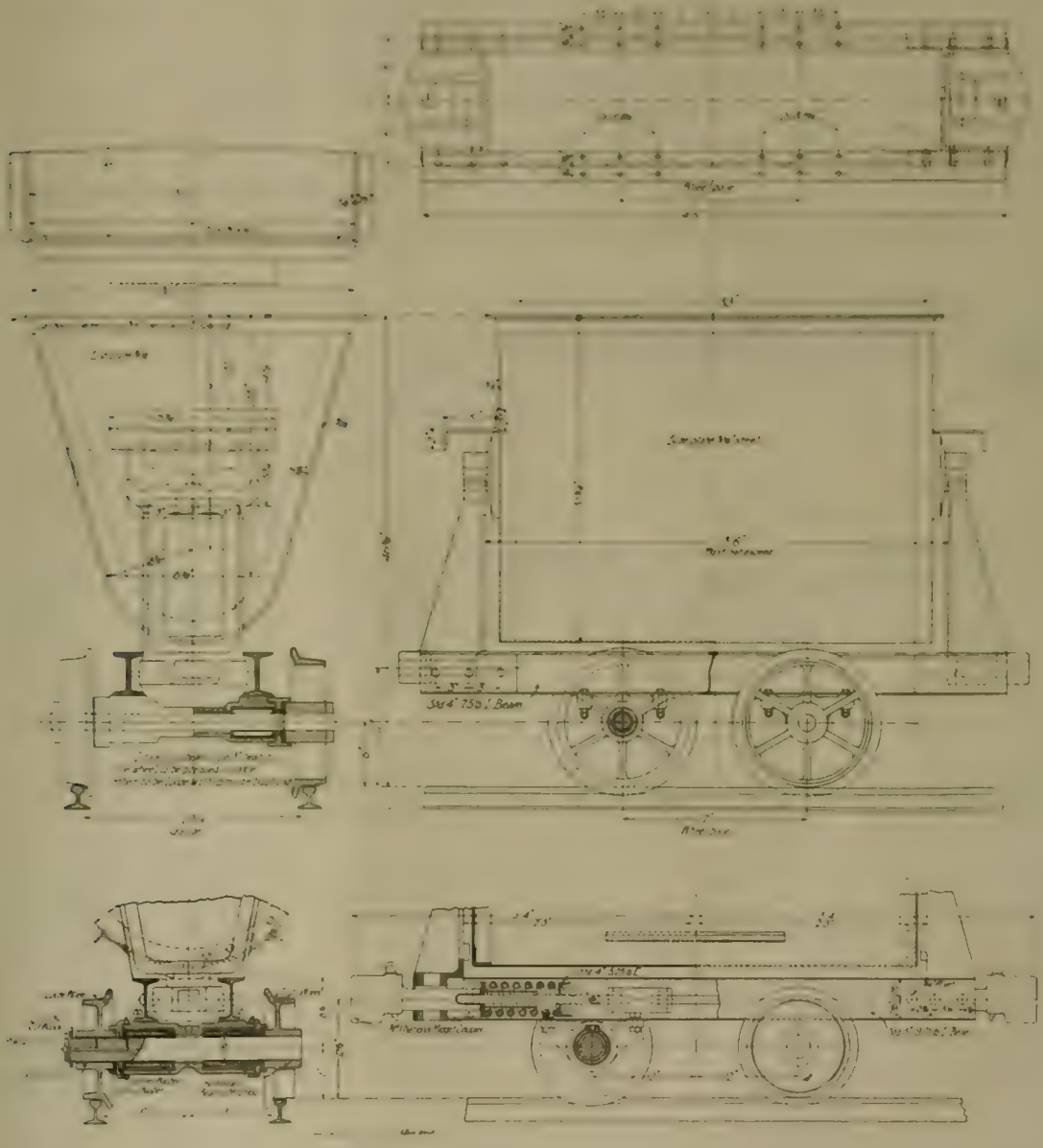
Fig. 8. Diagram illustrating effects of heave along a fault in tilted beds.

Production of minerals in Queensland for the quarter ended March 31, was £264,927 as against £284,755 in 1909. Following are the details, the figures in parentheses are for 1909: Value of copper, £179,-773 (£180,532); silver, £13,966 (£31,552); lode tin, £25,103 (£19,682); alluvial tin, £19,874 (£6526); lead, £2123 (£25,482); wolfram, £17,011 (£4788); bismuth, £403 (£400); molybdenite, £1602 (£2819); manganese, £566 (£932). The value of the yields from the several districts during the quarter were: Archer River, £61; Bowden, £110; Charters Towers, £4095; Chillagoe, £51,289; Cloncurry, £12,416; Cooktown, £5478; Croydon, £288; Etheridge, £27,991; Gladstone, £1236; Gympie, £169; Herberton, £33,544; Ingham, £1744; Mount Morgan, £102,272; Mount Perry, £12,-880; Palmer, £658; Ravenswood, £386; Rockhampton, £5740; Stanthorpe, £4629.

Side-Dump Mine Car

The accompanying illustrations show the details of construction of the side-dump mine car which has been adopted for use in the mines of the Copper Queen Consolidated Co., at Bisbee, Arizona. The body is made of $\frac{1}{4}$ in. steel sheet, strengthened at the corners and riveted with $\frac{3}{8}$ in. rivets spaced 3 in. apart. The truck is made of I beams bolted to the axle-casing. One wheel is pressed on the axle, and the other runs loose, with a bronze bushing. The latter is held in place and protected from dust by a sleeve screwed upon the axle-casing and catching the hub of the wheel. Cast-steel upright supports are mounted on the truck to carry racks in which engage the pinions on the ends of the car-body, by means of which it is rotated. The design shown is for a car of 15 cu. ft. capacity. Similar cars of larger size, containing 33 cu. ft., are in use on the underground electric roads by which the ore is assembled from all the mines of the company at the pockets in the Sacramento shaft. These are equipped with drawbars and buffers, and use the No. 1 National midget coupler. Standard 5 in. I beams are used for the framework of the truck. In both sizes of cars the rack and pinion is protected from dirt by $\frac{1}{4}$ in. steel shields. Details of the truck of the 33 ft. car are also given.

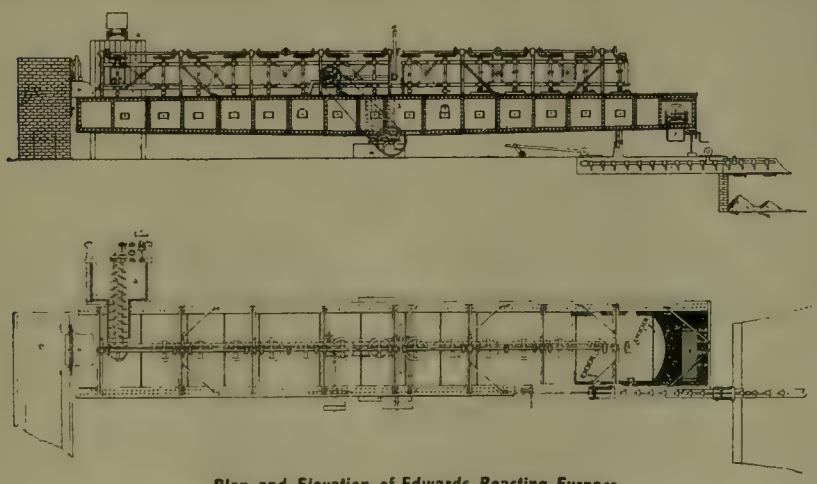
Cars of almost identical design are used at the North Star mine at Grass Valley, California. At the latter place such cars when employed for hauling concentrate in the mill, are drilled with holes in the bottom, and the inside of the car-body is lined with cocoa-matting, faced with No. 10 mesh steel screen, riveted to the steel-sheet. This forms a means for draining the concentrate. The Grass Valley car is illustrated in the lower figure. The details of these cars were worked out by Gerald Sherman, superintendent of mines at the Copper Queen, and formerly at Grass Valley, California.



Roasting at Kalgoorlie

By 'METALLURGIST'

*The discovery of telluride ore on Block 45 in 1896 and a little later on in the Lake View Consols mine, set the metallurgist experimenting as to the most suitable method for the treatment. Various schemes were tried, with varying amounts of success, until J. W. Sutherland, metallurgist of the Lake View Consols, tried roasting in the ordinary assay muffle furnace. After such roasting the ore was readily treated by amalgamation and cyanidation, and this induced him to make experiments on a large scale. In 1897 the first roasting furnace on the Golden Mile was erected on the Lake View mine. The furnace was after the style of the old hand-rabbled reverberatory of Victoria, the length being 15 ft. and width 11. As it was necessary to dry-crush the ore before roasting, the Lake View loaned one of the ball-mills at the Associated mine and crushed the ore through a ⅛-mesh screen. The results of roasting larger quantities were equally successful, and it is on these results that the foundation of the present roasting plants is based. It being decided in 1898 by Mr. Callahan, manager of the Lake View Consols, to install a properly equipped roasting plant, instructions were given to Mr. Pratt, the engineer, to proceed to the Eastern States and inspect and report on the roasting plants then in use. While he was making his report the Lake View Consols office was in communication with Europe, and when the whole of the information was available a Brown straight-line furnace was ordered, and in 1899 the two furnaces started roasting on a large scale, and had not the Swansea people supplied rope in place of chain for the rabbles, the obtaining of a sweet roast would not have been so seriously delayed. It is not intended to go into technicalities, but nearly every one is conversant with the varying results obtained, sometimes necessitating the blasting out of the sands in the leaching vats. While Mr. Pratt was away the Great Boulder Main Reef decided on a roasting plant, and sent Mr. Marriner, the metallurgist, to the Eastern States to inspect and report, and it was on his report that the Mt. Morgans shaft-furnace was installed on the Main Reef in 1899. In connection with this furnace, one of the newspapers went so far as to say that the Great Boulder Main Reef was the first mine here to pay a dividend on sulphide ore, and the extractions were given out at 96% of the gold content, although later investigations qualified these reports. While these two mines were roasting and completing the roasting plants, the Associated and the Kalgurli mines were erecting the Ropp furnaces, the Perseverance the Holtoff-Wethey, and the South Kalgurli the Brown straight-line. It was during 1900 that these plants were put into operation. The Great Boulder had pinned its faith to the Kooneman process, and under Mr. Kooneman's superintendence was erecting a gas-fired vertical-column furnace somewhat similar to the Stetefeldt. This was designed for roasting the ore in particles as large as nuts and to do away with the fine grinding which was necessary with all the other plants. Unfortunately, this plant soon proved a failure, and in 1900 the management chose Mr. Lilburne, the metallurgist, to take a sample of the Great Boulder sulphide ore to Ballarat to be roasted in the Edwards pyrite works. The trials were successful, and on his return the erection of a set of Edwards furnaces was undertaken. A feature of these furnaces was to be the gas-firing, and a gas-plant was installed, but the economy of gas fuel was not the success anticipated, and after a lot of hard work the officials had reluctantly to revert to wood for fuel.



Plan and Elevation of Edwards Roasting Furnace.

In 1901, with all the different types of furnaces roasting, the metallurgists were busily engaged in obtaining best results from the furnaces, and in comparing results with the adjacent mines. The mines were rapidly developing large sulphide orebodies, and an increase of roasting plant was becoming urgently necessary. The managements were anxious that the additional furnaces should be of the best of the different types, so naturally the roaster and roasting was the most prominent metallurgical topic. The Kalgurli mine was the first to admit that the Ropp was not suitable for the work, and in making additions to the plant discarded this type entirely and erected in its place the Edwards furnace, with a single line of rabbles, and with raising and lowering gear to alter the furnace hearth to any level which was thought necessary. Nine of these furnaces started work early in 1901. At about this time the Ivanhoe, which had been running a small tower furnace with a capacity of three tons per day, since February 1900, and the Brownhill, where the stamp-mill and wet-crushing with concentration was in use, decided that the concentrate being produced could

*Abstract from 'The Gold Mines of Western Australia'.

be more profitably treated by roasting at the mine than by shipping to the custom works, and placed an order for Edwards furnaces. The Ivanhoe installed three single rabble and the Brownhill two similar furnaces. The results obtained after this change proved eminently satisfactory, the furnaces at the Ivanhoe being still in use. A fourth furnace was added in 1902 and a fifth in 1906, making a total of five Edwards Simplex furnaces in use at the present day. The Great Boulder management at this time was also anxious to increase the monthly tonnage of ore treated, and not being altogether satisfied that the Edwards furnace was the best, instructed G. M. Roberts to investigate and report on the Merton furnace. On his recommendation the company decided that the additional furnaces should be of the Merton type. These furnaces were duly installed and were working in 1903. The Associated company, now being thoroughly convinced that the Ropp furnace could be improved upon, were making inquiries as to what should be installed. All the furnaces were getting fairly good results, and in making the choice the company, helped by G. M. Roberts, who pronounced strongly in favor of the Merton, decided to erect ten of this type. These were complete and running in 1904. The Kalgurli had decided again to increase the monthly tonnage, and the South Kalgurli to overhaul its mill and make it up-to-date, and the question of the best type of roaster was exercising the minds of F. A. Moss on the Kalgurli and J. Morgan on the South Kalgurli. The Kalgurli decided on installing the Edwards furnace with a bricked-in hearth in place of the tilting furnace. The South Kalgurli replaced the Brown straight-line with the Merton. These alterations and additions were completed in 1905. The Golden Horseshoe, which was using the stamp-mill and concentrating, had decided to follow the lead of the Ivanhoe and Brownhill and roast the concentrate from the Wilfleys at the mine. The management approved of the Edwards plan of working with two lines of rabbles, in place of the single line as used on the Kalgurli and other mines. After going into the plans with the maker, J. W. Sutherland placed an order and constructed the first duplex furnace for roasting concentrate at the Golden Horseshoe in 1905. The results of this furnace were so excellent that the Perseverance, seeing the improvement that was possible with the double line of rabbles, made drawings for the replacing of the rabble of their Holtoff-Wethey furnaces by the Edwards duplex, and the using of the lower hearth as a conveyor and cooling surface. This alteration was successfully carried out by G. C. Klug in 1905, this being the first duplex furnace roasting sulphide ore on the Golden Mile.

The Associated was then putting in another Merton. The Associated Northern decided in favor of the Merton, while the Oroya-Brownhill replaced its Edwards by a Merton. The furnace practice had now settled down to the two types, with the exception that Mr. Dagger, of the Associated, had designed and erected a two-hearth furnace, practically a combination of the Merton and Edwards, and called it the Associated furnace. Each furnace finds strong support with masses of figures of costs and extraction to bear out the claims of the makers. It looked as if the two types would have equal support for all time, but Mr Hamilton of the Great Boulder wishing to increase the tonnage and having both types of furnace in use having decided on erecting a duplex Edwards, and Mr Roberts of the Associated the strong supporter of the Mertons following his example, settled all arguments and pronounced the Edwards duplex as being the most suitable furnace for the Kalgoorlie sulphide ores.

As showing the enormous strides during the last twelve years that have been made in the roasting practice, the small reverberatory on the Lake View and the up-to-date plants working at the present day may be contrasted. While the industry of Western Australia has reaped the benefit of all the work done by the engineers and metallurgists in this line, it may not be out of place to mention that at Cripple Creek, in America, where telluride ore was known to exist at a much earlier date than the Golden Mile, the method of treatment adopted was the smelting of the rich product only. That field has now adopted the Kalgoorlie method of treatment, and not only can the mines be worked at greater profit, but dumps formerly valueless have been treated at large profit.

At the present time there are working on the Golden Mile plants treating a total for the district of 73,000 tons of crude ore each month, and 5900 tons concentrate, a record for any part of the world, and, considering the high cost of material, the costs and extraction have not yet been equalled by any other mining centre. The detailed equipment is as follows:

The Great Boulder G. M.: 12 Edwards simplex, 8 Mertons, 2 Edwards duplex, roasting 17,800 tons sulphide ore per month.

Great Boulder Perseverance: 6 Holtoff-Wethey, altered to Edwards duplex, roasting 18,000 tons sulphide ore per month.

The Kalgurli G. M.: 9 Edwards simplex, and 4 Edwards duplex, roasting 10,700 tons sulphide ore per month.

The Associated G. M.: 17 Mertons, 1 Edwards duplex, and 1 Associated furnace, roasting 11,300 tons sulphide ore per month.

South Kalgurli: 10 Mertons, roasting 9000 tons sulphide ore per month.

Associated Northern: 6 Mertons, roasting 3600 tons sulphide ore per month.

Kalgoorlie Gold Recovery Co., Ltd.: 1 Edwards simplex and 1 Edwards duplex, roasting 500 tons sulphide ore per month.

Chaffers G. M.: 4 Edwards duplex, roasting 2000 tons sulphide ore per month.

Golden Horseshoe: 3 Edwards duplex, roasting 1800 tons concentrate per month.

The Ivanhoe: 5 Edwards simplex, roasting 1800 tons concentrate per month.

The Oroya-Brownhill: 3 Mertons, roasting 900 tons concentrate per month.

Lake View Consols: 3 Edwards simplex, roasting 1100 tons concentrate per month.

Hainault: 1 Edwards simplex, roasting 300 tons concentrate per month.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Classification of Igneous Rocks

The Editor:

Sir—Seeing the classification suggested in your issue of June 18, by E. R. Rice, I submit another

IGNEOUS ROCK CLASSIFICATION FOR MEGASCOPIC USE

Acidic ← Light Colored					Dark Colored → Basic				
CHIEF Feldspar	ORTHOCLASE Alkaline, Potash Monoclinic 2 Cleavages at ~ angles (and Colored)			BOTH in about equal amounts (Anorthoclase)	PLAGIOCLASE Lime-Soda, Triclinic, Oblique Cleavage Fine striations on new surface (Albite, Oppositely, Labradorite, Anorthite)				NONE
	+ Hornblend - ong Pyroxe + Biotite - in cleavage + Augite - granular			+ Hornblend - oblique cleavage + Biotite - in cleavage	PYROXENES Augite Prism Angles 2 Cleavages at right angles				
	+ Quartz	+ Quartz	Hornblende or Biotite + Quartz	+ AUGITE + Quartz	+ Quartz	- AUGITE + Quartz	+ Quartz	+ Olivine	+ Olivine + Augite and Biotite
GLASS	Obsidian, Pumice, Pitchstones, Scories								
Surface Flows (See Porphyries Lavas Dikes)	RHYOLITE	TRACHYTE	PHONOLITE	QUARTZ-PORPHYRY (Felsite)		DACITE	ANDESITE	AUGITE-ANDESITE	BASALT
Dikes Intrusions (according Porphyritic)	As the texture approaches Gabbric "Porphyrite" is added to names above as " approaches granitoid							DOLERITE DIABASE	
Batholiths (according Granitoid)	GRANITE	SYENITE	NEPHELITE SYENITE	GRANO DIORITE	HORNBLENDE	QUARTZ DIORITE	DIORITE	GABBRO	
	Tuffs and Breccias								
% SiO_2	80-65	65-55	60-50	75-60	70-55	70-60	65-50	55-50	55-45	55-30

variation of Kemp's classification that may be of interest to your readers.

L. WEBSTER WICKS.

Los Angeles, June 25.

Some Matters of History

The Editor:

Sir—It has been my privilege to observe the development of the mining industry from within a short period of its inception, as in 1852 shortly after my arrival in California. I engaged in mining with pan and rocker in El Dorado county, and personally have participated in its evolution, from the 'long-tom', through the 'sluice', and the 'hydraulic' method up to 1860, when I took to deep mining, continuing in that occupation up to the present time. I was in Grass Valley in 1861 when there was not a revolving stamp or involute cam in use in that region, though it was then producing largely. Robert Watt told me that they had but lately discovered that thousands of dollars had been lost in sulphides. They were beginning to save them with Cornish buddles and rude shaking tables, shipping the product to Swansea for reduction. George F. Deetken started a revolution in gold saving at the Eureka mine in Grass Valley, when he succeeded in adapting the Plattner chlorination process to the profitable extraction of the gold from the quartz tailing which had formerly gone largely to waste, and his success undoubtedly inspired others to experiment, from which resulted the cyanidation process, as well as other great improvements. California is entitled to greater credit than is generally conceded for improvement in reduction machinery. In 1891 I was a member of the California World's Fair Commission of which Irving M. Scott was president, and at one time while at lunch in Chicago a gentleman came over to our table and shook hands with Mr. Scott, who introduced him to us as either Mr. Fraser or Mr. Chalmers, I now forget which, of the firm at that time engaged largely in the manufacture of mining machinery in Milwaukee. After he had left us, Mr. Scott made the statement that some years before the man introduced had gone over the mining region of California, and with pencil and paper had made drawings of the different quartz mills, and the various devices for reduction and gold saving purposes, all of California invention, and with that information had started in Milwaukee in a small way the firm of Fraser & Chalmers; which subsequently became the famous Allis-Chalmers company of world-wide reputation.

JOHN DAGGETT.

Black Bear, California, June 10.

Science and Practice

The Editor:

Sir—Much energy is wasted because of lack of co-operation between men engaged in scientific research and those engaged in industrial work, more especially those who have problems of a practical nature. These remain unsolved, many times, from lack of this spirit. Men who are working along different lines grow farther apart the deeper each gets into his particular field if they do not, to some extent, work together. In general, the scientific man works for his own interest and improvement, his main object being to establish or break down some theory. To him theoretical considerations are of prime importance. This kind of work is most fundamental and must be done in order that knowledge may advance along any particular line. As a rule the technical worker is engaged in the solution of a problem which will be of aid in some technical process. The scientific man has a better reference library at hand, more time to spend in thought, and, above all, less occasion for haste than one who is engaged in the solution of a practical problem, the non-solution of which means loss of money to those by whom he is employed. The library of the latter is frequently non-existent or, to say the least, very small. The routine work of the laboratory ofttimes also demands the greater part of his time and attention. This does not give him the opportunity for the clear thought, which should be given, in order that the best results be obtained in the least amount of time. Is it not possible for the man with the practical problem to make himself known to the scientific worker engaged in a similar line of work, so that he may find out what has been done along that line, giving the scientific man his practical opinion of the problem in hand, and, in return, getting the opinion of one who is engaged in pure science and not limited by consideration of cost? In this way the one would avoid, to a great extent becoming a 'fossil', and the other would get the help of an entirely different point of view together with the advantage of a library, which latter, as someone has recently and very much to the point said, "may be reckoned as so many thousand brain-power." An instance which recently came to my notice may serve to illustrate what can be done in

this direction. A friend of mine entered the employ of a large corporation for the purpose of solving some problems which proved stumbling blocks. The manager wanted to equip him a laboratory on the ground where he was to work. There it would be impossible for him to have many of the advantages that he could have in other places and it did not appeal to him as the best way to get results. He finally came to an agreement with the company along an entirely different and it would seem from what has been accomplished very much better line. The arrangement is as follows. He is to work wherever he may see fit, his idea being to take his work progressively wherever the men may happen to be who know the most about the particular problem in hand, and to work with them thus getting the advantage of their suggestions, specialized libraries, etc. This is one of the things which our higher educational institutions are for. Let us have more of this. I am sure, as far as I, myself, am concerned, that I would like to have more frequently the chance of consulting practical men.

R. C. Benner

Tucson, Arizona, June 18.

Dry Holes in Oilfields

The Editor:

Sir—A question worthy of some discussion presented itself upon reading the comprehensive article on the California oil industry, by Courtenay De Kalb, published in your issue of June 11, 1910. The question was suggested by a portion of a single sentence and has to do merely with the use of words, although it first came to attention through doubt as to the correctness of the statement, which was, "As there has not yet been a dry hole drilled within the proved area." In an article of technical nature the term 'dry hole' seems subject to criticism, as it is a colloquialism with all the faults of such. It is particularly misleading when used in description of a well drilled for oil. In nearly every well drilled in California water is found at some depth, and in some cases nothing but water is shown in drilling. Such a well would be *non-productive* and in loose speech called a 'dry hole'. In many such cases the operators lament that it was not strictly speaking a dry hole, as there is a possibility of the water having held back and concealed some small showing of oil. Therefore it seems not too much to ask that such words be used as will express the meaning. The word non-productive does such duty. A second question also arises where the expression 'proved area' is used. If a well were non-productive could it strictly be said to have been drilled in a proved area? Such a spot would be proved to be barren, and if the writer understands the use of the word proved, as applied to mineral deposits, it means only that portion of the deposit which has been proved to be productive in an economic sense. In the oil business the term is overworked, and lacks in definiteness savoring of the ordinary newspaper.

R. P. McLaughlin.

Coalinga, California, June 13.

Glass Separating Funnel for Use in Laboratory Amalgamation Tests

The Editor:

Sir—The conical shaped glass separating funnel shown in the annexed cut has proved to be an excellent elutriating apparatus in making bottle amalgamation tests in which the tailing and mercury were separated and assayed, much loss having occurred with other devices because a part of the slime was carried away by the wash water. In using this funnel the lower cone is filled with clear water and both cocks closed. After amalgamation has been completed in the bottle, the content is emptied into the upper cone, water added to dilute the pulp, and the stopper placed in the top. After being shaken an instant the mercury settles and is drawn into the lower cone by opening the larger glass cock. Some of the sand will pass through with the mercury, but very little slime will accompany it if the lower cone has been filled previously with clear water. The glass stopper is then drawn and the tailing emptied on a filter, then the smaller cock is opened and the mercury drawn into a dish. If the mercury be floured it can be quickened with a little sulphuric acid and the quickened mercury poured off from the small amount of sand which descended with it. The separation can thus be made with no loss of tailing.

Will H. Coghill.

Metallurgical Laboratory, Northwestern University, Evanston, Illinois, June 25.

Wet Gold-Assay for Prospectors

The Editor:

Sir—I have read with interest the articles of Robert De Luce and J. W. Howson on the wet assay for gold. I have used the same method occasionally for the past year and the results have come much closer to the fire assay than those given by Mr. Howson. I always pulverized my ores to 100 mesh and then put the samples with the iodine solution into a very rapid shaking device which was permitted to run for one or two hours. I added the re-distilled mercury direct to the pulp and solution without any filtration and then washed the pulp away with a stream of water. If the mercury was divided I could finally bring it to one mass by using a little nitric acid. By washing and then pouring from one receptacle to another there was not much difficulty in getting rid of foreign matter. By not filtering there is no danger of any precipitation of the gold by the filter paper. I might add that I have never succeeded in buying any mercury absolutely free from gold, so I always use a 1 c.c. pipette and make an allowance for the gold in the mercury. This last point should be borne in mind. I have often used this method to disprove the claims of a number of chemical or secret process fakers who operate here.

John Herman.

Los Angeles, June 27.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Tungsten salts are used in fireproofing cloth for curtains and draperies, in weighting silks, in glass-making, as a mordant in dyeing, and in steel manufacture.

Chrome ores are no longer shipped East from the Pacific Coast States in quantity. The Baltimore and other Eastern plants now draw supplies largely from abroad. Western chrome ores are used in the rough for furnace linings, principally by the copper smelters.

The world's emery production is about 35,000 tons per year, of which 9000 comes from the island of Naxos, Greece. The right of mining the emery is enjoyed by the inhabitants of certain districts, the Government transporting the product to Syra, where it is sold for about $20 per ton. The Naxos emery contains over 60% corundum.

Re-location of oil placer claims so as to replace individual by association claims should not be attempted without the advice of a lawyer familiar with the specific conditions concerned. The law regarding re-locations, and the laws, decisions, and department rulings regarding oil placers are so complicated that no general rule can be safely laid down.

Black sands found in connection with placer gold often contain rare minerals of value. They may be separated by various well known concentration processes. The whole subject was discussed by D. T. Day and R. H. Richards in a report of the United States Geological Survey, 'Mineral Resources for 1905', pp. 1175-1258, and in Bull. 285; the reports being based upon tests made at Portland, Oregon.

Free ore, as the term is used in the Joplin district, means ore containing blende or galena that may be saved without crushing. It is customary to erect screens and hand-jigs and save as much of such ore as possible while the mine is being developed. The large blocks of 'crush rock' are stacked and often in this way a pile of ore is accumulated that is sufficient to pay for a mill in advance of the latter being built.

Costs and methods of road building are frequently given in the Mining and Scientific Press and other engineering journals, especially those devoted to general engineering. Valuable data may be obtained at any time on application to the 'Office of Road Inquiry', U. S. Department of Agriculture, Washington, D. C. Many States maintain corresponding departments, and a letter addressed to the State Engineer at the State capital will ordinarily reach the right department.

Mine inspection service is maintained by most of the American States, particularly those in which coal is mined. The reports of the mine inspectors contain data relating to production and accidents and often also a copy of the mining laws. Such reports are well worth having and are usually sent on application. When in doubt as to the correct address, a letter of inquiry sent to the State Mine Inspector in care of the Governor, will be referred to the right officer.

Calcite is found in connection with fluorspar in the Kentucky-Illinois district. It is a by-product obtained in jigging and was long wasted. Recently a market to the extent of three to five carloads at a time has been found in New York. The material is pulverized and used in paint making. The value lies, first in correcting any acidity in the mixture, and second in the action of the mineral as an inert reinforcing pigment. There would seem to be a considerable market possible.

Geological Survey reports usually may be obtained upon application to members of Congress. A limited number are available to the Director of the Survey for free distribution, but this does not apply to monographs, folios, and topographic maps, which the law requires shall be distributed by sale. Any of the reports may be purchased at a nominal sum from the 'Superintendent of Documents', who may be addressed at Washington, D. C. Upon application he will forward a price list. The Survey does not maintain any list of names of people to whom all reports are sent on publication, though certain designated libraries and exchanges so receive them.

Manganese occurs widely distributed either alone or with iron, zinc, or silver. A frequent mode of occurrence is as a residual concentration at the surface of the ground, and the ore is cleaned by screening and washing. The value depends somewhat on the content of other minerals, but in a general way ores containing 6 to 22% of manganese are mined and sold. Manganese is used in metallurgy to impart certain properties to iron and steel, and in the chemical industries mainly as an oxidizer. For steel making the price ranges from $5 to $15 per ton of 2240 lb. delivered at Pittsburg or Bessemer, Pennsylvania, or South Chicago, Illinois. The schedule of prices of the Carnegie Steel Co. calls for ores containing not over 8% silica or 0.25% phosphorus. Deductions as follows are made: for each 1% excess of silica, 15c; for each 0.02% excess of phosphorus, 2c. per unit of manganese. Ores containing less than 40% manganese or over 12% silica, or over 0.27% phosphorus are subject to refusal at the buyer's option. Settlements are based on weights of ore dried at 212°F. The schedule works out:

Percentage metallic manganese.	Price per unit in cents. Mn.	Fe.
Over 49	30	6
46 to 49	29	6
43 to 46	28	6
40 to 43	27	6

For chemical work the prices vary, depending on the percentage of manganese present, consistence of the ore, and special applicability. It ranges up to $25 per ton.

Special Correspondence

LONDON

Cornwall Mining.—East Pool and Agar.—Uranium.—Dredging for Tin.—Tronoh Tin Mine Improves Condition.

During the last year or so I have referred several times to the misfortunes of East Pool and Agar, one of the companies working tin mines between Camborne and Redruth. This company has done well on the surface and has introduced successful metallurgical methods of treating low grade complex ore containing tin, wolfram and arsenic, adopting air cushion stamps and magnetic separation. While this good work was being done underground developments were entirely neglected. No real development was done at all, nothing but scraping out the poor stuff left behind in days gone by when complex ores were valueless. At the present time the position of the mine is critical. Operations are carried on at a loss and all sorts of efforts are being made to convert the company from cost book to limited liability concern and at the same time introduce the requisite funds for development. At the present time shareholders have been brightened by a discovery in the Agar section, where the newly introduced system of prospecting by cross cut has revealed an excellent body of ore. This is encouraging and should help to save the old mine from going under.

Much has been heard recently about radium in Cornwall. The Uranium mine, at Grampound Road, ships pitch blende to Germany and receives something on the radium content, and the St. Ives Consolidated has a laboratory in London where Sir William Ramsay is to extract the valuable content. More recently it is announced that Madame Curie has bought pitch blende from Botallack. It has been known for years that the mineral is present in the mine and has been found on the dumps. In one of the workings it has in former years been sorted out before hoisting to the surface.

Exploitation of tin gravel is receiving attention in several parts of Cornwall at present, and there is some probability that an old industry will be revived on modern lines. In the high lands between Newquay and St. Austell, and also in the northeastern part of the county, gravels used to be sluiced at a profit, but many deposits are covered with peat bogs and at others there is no water for washing or fall for disposal of tailing. One of the most interesting ventures at present is that on Goss Moor, directed by C. G. Lush. A dredge, built on Australian lines, has been erected and men experienced in its operation brought over. Then, again in the Fowey valley, north of Liskeard, F. W. Linck is testing ground with the Banca drill as a preliminary to erecting a Werf Conrad dredge. The tests show a depth of 10 ft., averaging 16c. per cu. yd., with black tin at £80 per ton. The Tronoh tin mine in Perak, Federated Malay States, is now emerging from a prolonged period of mismanagement. The credit for the improved position is due to the new manager, Harry D. Griffiths. The former management had neglected to properly protect the surface workings from collapse and there was consequently a danger of the whole mine being lost. R. J. Frecheville agreed with Mr. Griffiths that open-cut working should be abandoned. During the past year the surface has been filled, thus preventing the accumulation of water and slime which used to cause dangerous rushes and floods. Underground the method has been adopted of working the deeper levels during the rainy season and the upper during the dry months. The whole of the 'karang' is now extracted instead of leaving poorer qualities behind. All these methods have been adopted so as to make settlement of the ground more even and regular, and to prevent as far as possible the accidents due to caving. The average content of the ore is lowered but the safety is increased. This is the part of the property known as No. 1 mine. In some parts it has been worked to bedrock and the deposit cannot last much longer. Additional pumps have been provided in order to drain the underground water from the ground known as No. 2 mine and the pumping capacity is now 1,000,000 gal. per day. By this means the water level has been reduced and it is now possible to start sinking shafts and undertake mining development has also been commenced on No. 3 mine. During the year 1909, the amount of karang mined was 20,-852 cu. yd. and 24.9 tons of tin concentrate was recovered. This sold for £167,755 or £80 10s. per ton. The amount mined in 1908 was only 156,366 cu. yd. producing 1712 tons of concentrate. The cost at the mine was £115,947 and general expenses, depreciation, and taxes brought the expenditure to £137,187. The total income was £175,962 leaving a balance of profit of £38,774. The year commenced with a balance of £12,216, dividends at the rate of 10% absorbed £16,000, and £19,016 has been written off the property account, leaving £15,974 to be carried forward. An unpleasant feature of the former directorate was that the white and yellow managing directors had combined to lend themselves moneys belonging to the company. These debts are being gradually liquidated, but the yellow man has not been removed from the directorate despite urgent protests on the part of shareholders.

Map of Cornwall.

JOHANNESBURG, TRANSVAAL

Mines Training School.—Labor Statistcs. — Values in Depth. — Possession Island to be Prospected for Diamonds.

For many months past the Transvaal Government and the Chamber of Mines have had under consideration the establishment of a Mines Training School. At one time it was believed that the York mine, near Krugersdorp, would constitute a satisfactory property for the purpose, but after considerable negotiating and an examination of the mine by R. N. Kotze, the Government engineer, it was announced that it had been found impossible to carry out the idea of establishing a fully equipped training school, but that a start would be made in a fresh direction. Arrangements have now been concluded with the directors of the Wolhuter Gold Mines Co. whereby 50 youths under suitable instructors will take a contract at the mine under ordinary working conditions. Tenders will be invited at an early date for the erection of the necessary quarters at the mine and when these approach completion the Government Mines Department will be ready to consider applications from young men who wish to be instructed in mining. The Mines Department will provide for accommodation of learners and capable instructors will be appointed to look after the work. The training school will probably start toward the end of the current year. This establishment is, of course, distinct

from the Transvaal University College into the curriculum of which mining and metallurgy and the allied sciences and arts enter extensively.

Some highly interesting statistics relative to the numbers of natives employed by Witwatersrand mines have recently been published. The tables in question state the full complement of individual mines and the numbers actually employed. A column also sets forth the percentage ratio the former bears to the latter. Some of the mines had only about one-half their labor complement at the end of the year whereas others employed rather over 100% of their requirements. It is well known that natives have distinct likes and dislikes in the matter of employment on the Rand mines. In the first place they prefer outcrop properties to deep levels, since they can climb to surface after their daily footage has been drilled in them, whereas in deep-level properties they must wait their turn in an ascending cage or else undertake the exertion of climbing several hundred feet of ladders. Natives also prefer old compounds with earth floors and crumbling walls to the new brick and cement modern structures since the former more closely resemble their own habitations than do the latter. At the end of December last the largest employer of native labor on the Rand was the East Rand Proprietary which had 15,300 at work. The Randfontein South employed 11,141; Crown Mines 9734; the Geldenhuis Deep 5693; and the Rose Deep 5108; all the other gold mines had less than 5000 colored employees.

Some little while ago the mining world generally and the investing public at large were greatly concerned with the problem as to whether the conglomerate beds of the Witwatersrand were becoming poorer in depth or not. The increased contribution to the gold output of deeper-level companies together with the gradual decline in grade were the two factors which brought out a belief that the greater the depth at which mining operations were prosecuted on the Witwatersrand, the less would be the recovery of gold per ton. Authorities intimate with the policies of the controling corporations of Johannesburg, and the nature of the Main Reef beds, vigourously championed the view that the decline in grade was due to a reduction in working costs which brought large zones of low-grade ore within the limit of profitable extraction and treatment. This explanation of an economically sound policy appears to have been universally accepted, for during the last year or two one has heard but little from those who contended that the banket beds become impoverished in depth. But if the most up-to-date evidence in support of the statement that there were rich and poor zones along the dip of the beds as well as along the strike were needed one might cite the cases of the Witwatersrand Deep and the Angelo Deep as having a singular bearing on this important point. It is common knowledge that during the initial stages of development and crushing, the Witwatersrand Deep proved a most disappointing venture and its performances in comparison with those of neighboring mines at outcrops were taken to signify the lesser value of the conglomerates at depth. Of recent years, however, the Witwatersrand Deep has opened up in a highly satisfactory manner. It is now equipped with one of the largest milling plants under one roof on the Rand, and is one of the leading producers and profit earners on the entire Rand Gold Field. Today developments in the lowest levels of the property are disclosing better ore than in any other section of the mine. A parallel case is afforded by the Angelo Deep. Twelve or eighteen months ago this property was taken into the East Rand Proprietary consolidation scheme and there were not a few objectors to its participation in the amalgamation, for at that time the ore disclosed was barely profitable. Lately, however, the developments have been exceptionally good in this property and it might indeed be said that in few other sections of the East Rand Proprietary are such consistently good values being disclosed as in the Angelo Deep portion.

The Government of the Cape of Good Hope is about to commence prospecting for diamonds on Possession island which lies off the coast of German South West Africa. During the last two years a large number of stones have been found along the German mainland and on Pomona and other islands. All or practically all these islands belong to Great Britain and have hitherto yielded about £30,000 per annum to the Cape Government from guano. It is not proposed to proclaim these islands public diggings, not for the time being at any rate, as it is feared that a rush would ensue, the birds would be driven away from the islands, and the guano industry would be ruined. The intention is to place a Government prospector on Possession island and to await the results of his investigations. Numerous other islands are also to be explored. The diamonds of German South West Africa are found in the sands to the south and north of Lüderitzbucht. They are unassociated with the usual minerals and are believed by many to be alluvial or wind borne. Another theory which accounts for this remarkable occurrence is that they have been washed up by the sea from the bed of the ocean. The country is dry and arid and is one of the most windy and sandy on earth. There are a few waterholes at different points but most of the expeditions have to carry water for great distances, the beasts of burden employed being camels and donkeys.

MELBOURNE, AUSTRALIA

Coal Strike Disastrous.—Low Price of Metals.—Cloncurry Doing Well.—Mt. Morgan.—Gold Output Declines.—Deep Leads Fail.

Nearly six months of the current year has passed and in reviewing the results of the mining industry in Australia for that term it is to be emphatically declared that what with low prices, declining gold yield, and labor troubles the position is more unsatisfactory than it has been for some years. The greatest disaster which befell Australia was the coal strike at Newcastle, New South Wales. A number of socialistic agitators finding that the high wages which they had secured through the co-operation of the proprietors of the coal mines was attracting labor to the field and affecting employment, decided to strike. Through the intervention of the State Government work was resumed after a stoppage of some five months. But the industry is far from being in the position it was before the disturbance took place. The men are dissatisfied and the owners feel that they are walking on dangerous ground. As the result of the stoppage of coal exports to the East there has been a considerable falling off in the oversea trade. In Victoria the Government having found by boring that a large seam of coal existed in Southern Gippsland, at Powlett basin, has established a State mine. The effect of this enterprise will be to deprive Newcastle of much of its Australian trade. So it can be seen that so far as the working miner at Newcastle is concerned, he will have to adjust his conditions to the altered position of the local industry. This will entail considerable hardship owing to the shortness of employment. Matters are being still further complicated by the decision of the Federal Government to apply anti-trust legislation to the field. Considering that the combination of proprietors has resulted in the miners of the district having the mining rate raised from 3s. 2d. to 4s. 6d. per ton it is hard to see how they are to benefit by the operators combination being destroyed because such action would again throw the collieries into competition, and a lower rate of wage would prevail, strikes would follow, and probably an attempt to nationalize the mines. How this is to be done appears to be simple to labor extremists, but in actual practice unless a policy of confiscation be adopted, it will be extremely difficult to carry out.

The low price of the industrial metals has affected copper mining. Fortunately for the flotations in the Cloncurry district of Queensland, sufficient working capital was furnished at the outset to permit substantial development to be done. It is now established that several important mines exist in that far-away part of the continent. Of these the Hampden and Duchess mines have certainly opened up more satisfactorily during the last few months than any others. To increase ore reserves as has been done from under £500,000 to £1,100,000 in 12 months is no small feat, especially when a depth of only about 400 ft. has been attained. The Mount Elliott mine is the other leading mine of the district, and it will soon be smelting. Unfortunately here-

the grade of ore at depth has been disappointing. Bewick, Moreing & Co.'s Great Fitzroy mine is between the devil and the deep blue sea; the ore is low grade and the problems involved in its treatment are such as to cause the greatest anxiety. The engineers of the field are now puzzling out how to deal with the concentrate of the sulphurous ore. On the other hand Mount Morgan has reached the point where in future it will be not only a great gold producer, but a great copper producer. The ore at depth carries about 3% copper and 6 dwt. gold per ton. The company will soon be able to draw upon supplies of pyritic ore from the Many Peaks mine.

The gold yield throughout Victoria shows a decline. Taking the figures for the past four months of the current year they compare with those for the corresponding periods of the previous two years as follows:

	Fine oz. 1908	Fine oz. 1909	Fine oz. 1910
Victoria	198,199	206,651	189,278
New South Wales	77,301	66,486	63,456
Queensland	134,408	127,411	139,893
Western Australia	556,351	529,159	481,110
South Australia	2,600	1,400	2,480
Tasmania	20,000	20,000	14,800
Total	988,161	941,489	891,017
New Zealand	150,077	135,843	142,070
Grand total	1,138,238	1,077,332	1,033,087

The reasons for this decrease are not difficult to state. In Western Australia, which holds the premier position, the mines on the Golden Mile, at Kalgoorlie, are all showing lower grade as depth is attained. Even the most important property, the Great Boulder, though keeping up its dividends, is proving no exception to the rule. The annual report of the Ivanhoe, another of the great mines of the field, discloses the same thing. By adding to the crushing plants the managers are endeavoring to maintain the rate of dividend but that means eating up reserves the more quickly. In Victoria deep lead mining is in bad state, owing to the failure of the mines farthest down the leads to give profitable results. The water is heavy and the gold is distributed over a large area. With pumping charges so high the mines cannot pay. Bewick, Moreing & Co. have abandoned the whole of their deep lead ventures in Victoria. One of these, the Berry United, has been taken up by a local company, but results are doubtful. Bendigo just about holds its own, but in Ballarat mining is almost past. In New South Wales the gold mining industry never has been a factor of any importance, but in Queensland it has. There the story is the same as in Western Australia; with depth declining values have to be faced. The position, therefore, is that unless in the vast extent of unexplored country in Australia some new goldfield be discovered, there must be a declining gold output. The only new field of any promise is at Tanami, in central northwest Australia. This is a desert region and although a number of prospectors are there, it is plain that the only chance of the field is for them to prove that the large reefs which exist carry gold in sufficient quantity for the State or private enterprise to furnish railway connection and so to make the place habitable. The South Australian Government has been successful in proving the existence of good supplies of water on the field by boring. Returns so far seem fair though the work done is so limited as to give no real idea as to the ultimate fate of the locality. Little alluvial gold is to be found as the reefs are not much disintegrated. Therefore, the necessity of more energetic work is evident.

At Broken Hill the Proprietary company still has its great mine shut down. This is entirely due to the fact that the workers urge that the industry must adjust itself to the wages and not the wages to the industry. Men to the number of 1900 consequently are out of employment and the company is confining itself to treating at its Port Pirie smelting works the lead concentrate which it buys from the other mines.

FAIRBANKS, ALASKA

Iditarod Rush. — Quartz Miners Stay at Fairbanks — Placer Mines Short of Labor. — Gold Shipments

There seems to be no doubt that there is some good ground in the Iditarod district as gold has actually been brought back and weighed. Flat creek seems to be the richest but pay has been reported on Willow, Discovery and Granite creeks. That all the best reports have been believed was shown by the first big rush as soon as navigation opened. Small boats followed the ice down while the big boats got away as soon as possible. Leaving within two days were the *Tanana*, *Delta*, *Yukon*, *Dusty Diamond* and the *Evelyn*, while the *Martha Cleo* and the *Minneapolis* followed a day or so later. Four home-built steamers carrying passengers will sail shortly. All steamers leaving, except the *Minneapolis*, have carried limit loads of outfits and passengers. Before the fleet left reports that the stampede was not justified were received, but not heeded. Many have gone with the idea that if the Iditarod does not develop as expected they will move over the divide to the Kuskokwim. During May the stampede was unexampled from this camp. About 1000 people will leave here this spring for the new camp with freight aggregating at least 1500 tons. Many merchants are shipping stocks. Notwithstanding this efflux, the production of gold to date is larger than that of last year, and the season's output should at least equal that of last year. It is a significant fact that none of the quartz miners are leaving. The properties now being developed look too good to be deserted. During the month past the Tolovana Mining Co. shipped 10 tons of ore to the Fairbanks mill. This gave returns of a trifle over $70 per ton. The tailing assayed $2.35 per ton, showing that rock from their Willow Creek property is practically free milling. There is quite a movement in the stock of this company as a result. Stock in the Jupiter Mars Mining Co. is also on the rise since the Redwing Mining & Leasing Co. has taken hold of part of the property. The leasing company is now actually engaged in sinking, and if the ore still holds its present values at 100 ft., a mill will be ordered this season. Until then, ore will be shipped to the new 10 stamp custom mill at Chena, which will be in operation by the middle of August. Emil Furstenau and S. R. Calvin are at the head of the leasing company. Another strike of galena at the head of Cleary creek shows 170 oz. silver per ton with a trace of gold. This find is reported by Burnett & Yachon. On Dome creek, Spaulding & Clough have timbered their 60-ft. shaft to hold it this summer and are driving an adit from the lower end of the claims. The vein showed 4 ft. of good ore under cover. On the extension of this lode a sample from the Wild Rose Mining Co., taken from the outcrop gave returns of $540 per ton. This claim is owned by Mrs. Spaulding, Mrs. Brumbaugh, Mrs. Meyer, and Mrs. Fairburn. Cook Bros. have located a new vein on Fairbanks creek showing about 2 ft. of base ore that assays $21 in gold and 57 oz. silver per ton. The ore is a mixture of iron and antimony sulphides, the antimony containing most of the gold and silver. They have also found a lode carrying scheelite, the first in this district that has been found in place. Both veins will be further prospected this summer. Herschberger, Buell & Phipps have discontinued work on the divide between Cleary and Eldorado on account of water. Though this was only a small amount of surface water, no means was at hand to handle it, and the partners have now moved to their property on Willow creek for the summer. Mellus & Nirich have found good ore on Willow creek, but the work has now been stopped by litigation. This vein seems to be the extension of that owned by Herschberger & Co., and exposed at the head of Cleary creek. Ten tons of ore run through the Fairbanks test mill by Mr. Rhodes from his Bedrock creek adit gave returns of $150 in free gold per ton. The adit is now in 550 ft. and still in good ore. An air-shaft will be sunk. The adit will then be pushed to the end line of the claim, as prospect shafts above show even better ore. Charles Crawford has finished his water-power arrastre at

his lease on part of the Rhodes lode. It is expected that there will be enough water in Bedrock creek to run all summer. It is probable that Mr. Crawford's example will be followed by many of the claim owners, at least till the custom mill at Chena is in operation. The vein owned by Lawson, Sommersett & McCarty shows better with depth. A pocket of rich ore was found recently that was suitable for jewelry. The quartz varies from 8 in. to 2 ft. in width and is practically free milling. This property is on the Fairbanks-Wolf divide. Having located a gold-bearing lode in the gneiss and quartzite at the head of Moose creek, Alois Fredericks has been cross-cutting to find the vein at a depth of 300 ft. Surface prospects showed good rock. The cross-cut is in 140 feet.

Placer miners are having some difficulty getting sufficient labor at present, although several parties of laborers have just arrived over the trail. It is thought that there will be no difficulty in a few weeks when boats begin to arrive from the outside. The oft-repeated assertion that Fairbanks placers are about worked out sounds out of place this season. Fish creek, where little has been done so far, has developed a good pay-streak, and many outfits are working. The lower end of Goldstream is beginning to show the pay from the famous No. 17 Below down to 26 Below. The valley is so wide it has taken some time to find the old channel, as the pay-gravel lies about 50 ft. deep. It seems now to be on the upper left limit. A new pay-streak has also been found on the second tier of bench claims opposite 7 and 8 Below Goldstream. After holding the ground for years, it was recently sold by Wade Joslin for $500. Shortly after, pay was found. The lower end of Dome and Vault creeks will show big production this year, and Eldorado promises to produce considerably. Since driving the long tunnel that drains the upper part of the creek where considerable wet ground was always found, no difficulty is anticipated. The first mail boat leaving Fairbanks took the maximum load of bullion, $1,000,000. About $500,000 was left in the vaults for future shipment. This was mostly from winter dumps. Sluicing is now general, and $10,000 to $15,000 pokes are being commonly filled

NEW YORK

Copper and the Market.—Imperial Copper Co.— Needles Smelter and Goldfield Ores.—Batopilas M. S. & R. Co.—Mineral Development Co. and Nueva Luz Shaft.—Oil and the Standard.

The absence in Europe of several of the important factors in the metal market, including Messrs. Adolph Lewisohn, John D. Ryan, Daniel Guggenheim, Urban H. Broughton, and Samuel Untermeyer, has given rise to the belief that some organization is being effected to control production. A heavy sale of copper abroad is said to be about completed, a sale which will take care of 100,000,000 lb. This is considered preliminary to the re-launching of the copper merger, which unfortunately refused to leave the ways last winter when flotation was attempted. In the meantime the porphyries are breaking all records. Utah Copper is producing at the rate of 142,000,000 lb. per annum, including its half interest in Nevada Consolidated. This production leaves but a small margin between Utah Copper and the Phelps-Dodge Co. as the second largest producers in this country. Utah Copper turned out 8,862,900 lb. during May, while Nevada Con. broke all previous records with an output of 6,000,000 lb. Inasmuch as the Calumet & Hecla has for some months been curtailing production about 14%, and the Phelps-Dodge people have stated that they were not crowding production, the inference is plain that the porphyry companies mean to use their overwhelming output as a club in securing a dominating position in any proposed copper merger. The board of directors of the Chino Copper Co. has been reduced from 15 to 9, the officers of the company are identical with those of the Utah Copper Co. Operations are under way at this property, which is to be on open-cut mine; steam-shovels being engaged in stripping the overburden from the ore. Steel is being delivered for the mill. The First National Copper Co., which operates the Balaklala, is turning out about one and a quarter million pounds of copper per month. The Imperial Copper Co. of Silverbell, Arizona, is one of the subsidiaries of the Development Company of America; it has for some years been developing its mines and building a smelter and now has a production of about 800,000 lb. per month. The company is about to be numbered among the low-grade milling coppers. Some of the ground recently acquired by the Imperial company has been exploited by diamond-drills and has developed some 7,000,000 tons of 2% porphyry. The ground in question lies between the original holdings of the Imperial and the holdings of the El Tiro Copper Co. Arrangements have recently been completed whereby the Imperial will take up the further development of the El Tiro ground. This will call for a smelter of several times more capacity than the present plant. The Development Company of America has recently organized an important railway project which will connect the Imperial Copper Co. plant with Port Lobos on the Gulf of California.

The Butte-Alex. Scott Copper Co., which is developing one of the promising new properties at Butte, has made a call of $1 per share; when the present payment is completed, $4 will have been paid. Some recent private sales of Boston & Montana are said to have been made at something above $500 per share. At the new smelter of the International S. & R. Co. in the first reverberatory is expected to begin operations about the first of August; the blast-furnace will not be completed for some months later. The first output will be copper matte. The first ores handled will be those of the Utan Consolidated and the Giroux.

The United States S., R. & M. Co. has almost completed its new plant at Needles, California, which is to have a capacity of 1000 tons per day and it is to handle the ores from the mines of southern Nevada. The Tonopah & Tidewater railroad has made a freight rate that will allow a great deal of ore previously thrown on the dump at Goldfield to be handled. Ores of $15 per ton value or over can now be sent to Needles and leave a fair margin for the operators. Contracts with many of the companies operating at Goldfield have already been made. The shares of the Batopilas Mining, Smelting & Refining Co. have been listed on the Paris Bourse; this company is the English concern, the control of which is held by the Batopilas Mining Co. L. H. Stevens, the president of the latter, died suddenly in London last week, just after completing negotiations for the financing of the English company. The factional fight in Cobalt Central has crystallized into a lawsuit in which wrongful payment of dividends is alleged and the removal of the present officers demanded. The Mexico Consolidated M. & S. Co., which is a Boston promotion, the company operating in Durango, Mexico, is another concern now being rent by fractional differences. Some three years ago the company paid dividends of $1 per share and stock was quoted around $15. The shareholders are now endeavoring to learn why the quotation is less than $1 and the company in debt to the extent of more than $300,000. The first payment of the subsidy given by the Mexican Government to the Mineral Development Co., which is sinking the Nueva Luz shaft at Guanajuato, Mexico, has just been made. The Nueva Luz property adjoins the old Valenciana mine, which holds the record as the greatest single precious metal mine ever developed on the American continent, and the Nueva Luz is expected to open the dip of the Valenciana vein on the Veta Madre. The check given by the Mexican Government was for the sum of $3750, and covers 150 ft. of depth gained in the shaft. This subsidy is unique in the history of mining in Mexico and was granted to the Nueva Luz because of the importance to the camp of Guanajuato of opening again the rich ores of the Valenciana veins.

The growing interest in oil has received a setback on account of the present demoralized conditions, but there is one step in contemplation which will go far to establish the oil industry in its proper position among investments. The Standard Oil Co. is to undergo a reorganization. It is expected that the increase will be on a basis of five shares for one. The present distribution of profits is at the rate of 40% per annum; five shares of new stock for one of old would give the shareholders an 8% investment. There is a

possibility also of a part distribution of the immense surplus of the company as a cash dividend. If this is done, the Standard Oil Co can easily dwarf all previous melon cuttings in financial history. The present surplus is estimated at $400,000,000. In addition, to which there is oil in storage of an estimated value of $,000,000, to say nothing of the plants and pipe lines. Allowing only a nominal value for these, and the company's tank cars and steamships, it is evident that the shares have a book value of more than the present price of $625.

WASHINGTON, D. C

Land Withdrawal Law —Acting Director Bureau of Mines.

The full text of the land withdrawal law as passed by Congress is as follows:

Be it enacted, etc., That the President may, at any time in his discretion, temporarily withdraw from settlement, location, sale, or entry any of the public lands of the United States, and the District of Alaska, and reserve the same for water-power sites, irrigation classification of lands, or other public purposes to be specified in the orders of withdrawals, and such withdrawals or reservations shall remain in force until revoked by him or by an act of Congress.

Sec. 2. That all lands withdrawn under the provisions of this act shall at all times be open to exploration, discovery, occupation, and purchase, under the mining laws of the United States, so far as the same apply to minerals other than coal, oil, gas, and phosphates. *Provided*, That the rights of any person who, at the date of any order of withdrawal heretofore or hereafter made, is a bona fide occupant or claimant of oil or gas-bearing lands, and who, at such date is in diligent prosecution of work leading to discovery of oil or gas, shall not be affected or impaired by such order, so long as such occupant or claimant shall continue in diligent prosecution of said work. *And provided further*, That this act shall not be construed as a recognition, abridgment, or enlargement of any asserted rights or claims initiated upon any oil or gas-bearing lands after any withdrawal of such lands made prior to the passage of this act: *And provided further*, That there shall be excepted from the force and effect of any withdrawal made under the provisions of this act all lands which are, on the date of such withdrawal, embraced in any lawful homestead or desert land entry theretofore made, or upon which any valid settlement has been made and is at said date being maintained and perfected pursuant to law; but the terms of this proviso shall not continue to apply to any particular tract of land unless the entryman or settler shall continue to comply with the law under which the entry or settlement was made: *And provided further*, That hereafter no forest reserve shall be created, nor shall any additions be made to one heretofore created within the limits of the States of Oregon, Washington, Idaho, Montana, Colorado, or Wyoming, except by act of Congress.

Sec. 3. That the Secretary of the Interior shall report all such withdrawals to Congress at the beginning of its next regular session after the date of the withdrawals.

Under this law the President, July 3, withdrew 8,495,731 acres of land valuable for power-sites, phosphate, and petroleum, lying mainly in the Western States and Territories, but including phosphate lands in Florida and oil lands in Louisiana. Much of this land had been covered by previous withdrawals. In the meantime the work of classification under existing laws has gone steadily forward. The Geological Survey is constantly valuing coal lands and recommending them for restoration to entry. The general effect of the appraisal of lands by this bureau is to raise the price. In May 1,097,261 acres of coal lands were reported. Of these, 329,334 were classified as non-coal land and the remainder valued, on a tonnage basis, at $58,508,120, as against $13,320,390 on the old acreage basis. The permanent Director of the Bureau of Mines has not been selected. Since some action was necessary on July 1, the President appointed George Otis Smith, Director of the Geological Survey, acting Director. There is much uncertainty as to when the permanent appointment will be made.

General Mining News

ALABAMA

FAYETTE COUNTY

For more than a year the existence of natural gas in considerable quantities has been known in a small area three miles east of Fayette. This region was recently visited by David T. Day of the United States Geological Survey who reports that four successful wells have been drilled showing gas with a closed pressure estimated at 600 lb per sq in and nine additional wells are in process of drilling. The gas is found at a depth of 1100 ft in a close-grained sandstone, estimated by the Providence Oil & Gas Co to be 50 ft thick. Small quantities of crude petroleum similar to that usually found in the Appalachian region were met at various depths above the gas. The strata pierced in the drilling consists of alternating layers of shale, sandstone and tight sticky clay, under ideal conditions for the accumulation of gas and oil. It is estimated that 5,000,000 cu ft of gas per day can be furnished from the four wells now completed. The gas is pure and is free from sulphur. The thickness of the gas-bearing stratum and the pressure developed indicate a satisfactory yield of gas as compared with other known gas fields. The amount of development work thus far done is not sufficient to show whether a supply adequate to the needs of Birmingham for domestic and manufacturing purposes can be obtained. This will be determined, however, by the completion of the wells now drilling. Mr Day urges the importance of detailed geologic mapping of Fayette county by the Alabama Geological Survey.

ALASKA

(Special Correspondence).—The operations of the Porcupine Gold Mining Co., on Porcupine creek, 40 miles from Haines, are in charge of S. C. Hunter this season, and the company anticipates a successful season's work. The bedrock flume has been extended and a high-line flume has been built from the Voegel flume where the latter comes into Porcupine creek. A steam shovel has been brought and is used in lifting material from the bedrock and dumping it into the trolley lift, the latter discharging into the sluice boxes.——The Wonder Dredging Co., controlled by E. E. Powell and associates, is operating one dredge on Wonder creek and one on Bourbon creek this season, and is building another dredge to operate on Dexter creek, all of which are in Nome district. The dredge on Wonder creek got in a full season's work in 1909, and that on Bourbon creek operated 28 days of that year. The ground in which the Wonder dredge worked ran 45c. per yard; that in which the Bourbon operated ran a trifle higher. Thawing plants have been installed at each dredge and with these the ground can be thawed to a depth of 60 ft. The thawing expense is estimated to be 8c. per yard of material handled by the dredges. The two dredges in operation are handling nearly 6000 yards per day, and the one under construction is to be of the same capacity as each of the others. Mr. Powell is on his way to Nome from Seattle. Several small dredges have been shipped to Nome for work in various parts of Seward Peninsula.

Nome, June 23.

ARIZONA

COCHISE COUNTY

The new electric cables have been strung in the Sacramento shaft of the Copper Queen company at Bisbee and the pumps on the 1700-ft. level are easily handling all the water there.——E. Stiffler and associates have secured a lease on the vein of galena ore that was opened on the Don Louis side of the Wolverine & Arizona, and are preparing to ship to the El Paso smelter. ——A consolidation of the California & Paradise Mining Co. and the Nebraska & Arizone Mining Co., operating in the Paradise district, has been effected, the new corporation being known as the California & Paradise Consolidated Mining Co. At present work will be centered at the Leadville shaft on the California & Paradise claims where a silver-lead ore is being opened,

and later operations will start on the copper deposits included in the Nebraska & Arizona lines.——The installation of additional boilers and pumps at the Bisbee Extension has been completed and work resumed on the 700-ft. level.——The Centurion will commence shipping some time this month. The ore will be hauled to Dragoon and forwarded from there to the smelter. Later a spur will be built to the mine.——Two carloads of machinery were shipped by the Young Brothers' Construction Co., of Los Angeles, to the Cicero Smith Mining Co., in the Dragoon district, and are now being installed at the mine.

GILA COUNTY

(Special Correspondence).—The Old Dominion at Globe is the scene of installation of new machinery and repairing of underground workings to an extent that may result in slight curtailment of the output during the near future. The shaft will be closed down for ten days until the installation of the new hoist is completed. On the extreme west side of the 1300-ft. level malachite was discovered the latter part of last spring in such quantity that it was supposed a large orebody had been reached, but this has proved only a pocket, disappearing in the limestone ten feet above the level. W. C. Carter recently took a lease on the Old Dominion's Transit claim, including a contract to sink a shaft on the same. At the 300-ft. level he cross-cut for ore, but development proved so unsatisfactory that he abandoned his lease. He has taken another lease on the Gray shaft and is now putting in a concrete foundation for a large electric hoist.——The Superior & Globe is installing the diamond-drill plant recently received and will begin its first drill-hole from the end of the north cross-cut.——Spencer W. Clawson of the Copper Reef reached Globe Wednesday evening. The two hoists recently installed on the property are in operation.

Globe, July 1.

PIMA COUNTY

The Cababi Mining Co., which operates the old Pichaco mine 50 miles southwest of Tucson, is sinking a new shaft with the intention of cross-cutting to the old workings at the 300-ft. level. The ore is high-grade copper-silver sulphides, and it is the intention of the company to equip the mine with additional machinery for the present needs, and later erect a reduction plant.

YAVAPAI COUNTY

Frank M. Murphy has purchased the properties of the Ideal Development Co. at McCabe which contain the old McCabe and Gladstone mines. These have not been worked for some time, but are credited with a good production in early days, $10,000,000 in gold bullion having been shipped from the McCabe alone.——The drift on the 400-ft. level at the group of the Pacific Copper Co. in the Silver Mountain district opened a 5-ft. shoot of copper sulphide ore that contains a high value in silver and gold. The company is building a road from the Minnehaha Flat road and will haul in machinery for further development when it is completed.

YUMA COUNTY

Plans for financing the Consolidation Copper Mines northeast of Parker have been completed and work commenced on the property, which consists of 140 claims. The new line which the Lewisohn interests are to build to the Planet mine will pass through the ground of the Consolidated, obtaining cheap transportation for the claims. These have been opened by a number of shafts when operated under separate ownership and a number of promising deposits of copper opened. The new company will commence work at the most central of these and sink a large shaft that will serve as a working avenue for the majority of the claims.

A hoist and power-plant is to be installed at the Golden Eagle property in the Quartzsite district this fall and the orebody prospected at greater depth. Several prospect shafts have been sunk on the ore opening it to a depth of 150 ft.——The Clara Consolidated is installing a 350-gal. pump on the river to meet the increasing demand for additional water, insuring the camp an ample supply for domestic purposes and fire protection.

CALIFORNIA

AMADOR COUNTY

(Special Correspondence).—The Bunker Hill has opened the vein for over 800 ft. near the 1750-ft. point. In places it attains a width of 30 ft. and carries good milling quartz. Cross-cutting from the 1950-ft. level still progresses and it is expected to intersect the vein about the middle of July. The monthly dividend of 5c. was paid on June 15. The head-frame was partly wrecked July 1 by a premature signal to hoist while a temporary track was being used. The skip jumped the track and shattered several braces and top timbers. The frame will be repaired temporarily, but a new one will be installed as soon as possible.——The Doyle lease on Amador Queen is developing stringers of ore in the hanging wall.——The scarcity of water is causing considerable uneasiness among local mining men, as it is feared that several companies will be forced to suspend operations before the end of summer.

Jackson, July 2.

EL DORADO COUNTY

W. C. Green has purchased a stamp-mill from the El Dorado Foundry at Placerville and will erect it at the Gold Channel mine near Georgetown where considerable rich gravel has been opened. There are several hundred acres in the group, and it is planned to have the mill in operation this fall.

NEVADA COUNTY

The North Star Mines Co. of Grass Valley has purchased the Minnie group, which is situated between the Gold Hill and Peabody properties. The property has not been worked for twenty-five years, though it is reported to have produced some rich ore when active.

SIERRA COUNTY

Several men have been added to the force at the Lookout mine near Alleghany and drifts are being driven along the 4-ft. vein that was recently opened. Several lots of ore have been taken from the drifts and will be crushed in the Sultana mill.——At Forest excellent progress is being made in re-opening the drift at the North Star placer which cut the Uncle Sam vein.——Arrangements are being made for the erection of a mill at the Kate Hardy.——F. W. Roher has secured a two years' lease on the Omega mine at Forest and has several men at work.——The hoist at the Gibraltar has been overhauled and work started bailing out the water.——The Cleveland mine at Scales has been shut down for the season on account of the lack of water, and cleaned up. It is estimated that $12,000 was taken out the last run.——The Lee Brothers, who opened a rich shoot on the outcrop of their claim in the Sierra City district, have sunk about 15 ft. on the vein and have erected a windlass to further prospect the ground.

SHASTA COUNTY

The smelter of the Bully Hill Copper Co. at Winthrop was shut down on July 1 to conform with the orders of the Forest Service, and about 400 men have been thrown out of employment. The smelter was practically re-built about two years ago when the Sacramento Valley & Eastern railroad was built from Pitt, on the Southern Pacific, to Winthrop. The motor-car service will be maintained on this line to carry mail and passengers, but the regular trains will be discontinued till some definite action is taken either as to building a bag-house or shipping the ore.——The Hazel Gold Mining Co. has given up its bond on the Uncle Sam mine west of Kennett and stopped work. It is reported that the company wished an extension of time on the same terms that it had been working under, but was refused by the Virginia Gold Mining Co., which owns the property.

YUBA COUNTY

W. W. Old and Earle Hodgins, representing Oakland capitalists, have secured a bond on the old American Flag group on Oregon creek between Camptonville and Sleighville and commenced work on the property with eight men. There has been considerable development on the group and some good milling ore has been blocked out. It is expected that a 10-stamp mill will be erected this fall if the development warrants it.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.) Work was resumed this week on the Wide West mine on Leavenworth mountain. The adit in 800 ft. is to be driven ahead to cut under the old workings from which $300,000 worth of ore was taken a number of years ago. H. Seffeld is owner. — A contract is to be awarded this week for the driving of the Prudential adit another 200 ft. This will take the heading past two known veins that make a strong showing on the surface. — Work was resumed last week in the advance of the Raymond adit on Griffith mountain. It is to be driven 600 ft. more to intersect at depth a series of veins. The ore-sorting plats at the Central mine have been completed and now a much heavier output of smelting ore is marketed. From 30 to 40 tons per week of this product is being sold, average returns of 5 oz. in gold per ton being realized. The mill is treating from 80 to 100 tons of ore per day.

Idaho Springs, July 2.

GILPIN COUNTY

(Special Correspondence.) It is likely that before this appears in print the famous Gunnell vein will be intersected by the Newhouse tunnel. George Collins, the manager, states that for the last 20 ft. the heading of the adit has been passing through stringers of lead and zinc ore. The water in the shaft has receded to the 850 ft. level, while in the Grand Army shaft it is down 950 ft. When the vein is reached a drift is to be run on the Grand Army vein to cut under the shaft, when a raise will be put through to obtain a circulation of air. — Work is being carried forward in the sinking of the shaft on the Coeur d'Alene mine on Gunnell hill. The shaft is down 675 ft., but before any levels are started it will be completed for 800 feet.

Central City, July 1.

OURAY COUNTY

The Angel Mining Co. has commenced work on its property south of Ouray in Wehawken gulch and is expected to be on the shipping list some time this season.— —William Rathmel, manager of the Savage Bear property, has gone East to confer with the stockholders regarding local treatment for the ore. In early days the high-grade ore was mined and shipped, leaving a large amount of low-grade blocked out that could now be treated profitably if handled at the mine.— —The Ores & Metals Mining Co. resumed work on the group July 1 after a shut down of a few months' duration.——John Erickson, who is in charge of the Mineral Farm mine, has received orders to resume work, and a shaft will be sunk to cut the limestone contact.— The shaft at the Legal Tender, now down 200 ft., is to be sunk to the contact this summer.— —The Wanakah Mining Co., operating the Bright Diamond mines, is centering work in the adit on the Iron Clad claim, which is designed as the main working avenue of the property. The upper tram terminal is now under construction and the tram machinery is on the road to the mine. Arrangements have been made with the railroad company for the grading of a spur to the American Nettie mill, which is being put in order to handle the output of the mine.

SAN JUAN COUNTY

Work is to be resumed at the Gold King mine in the Silverton district early this month, a small force having been started to prepare the mine for more extensive development. The mill will be overhauled, and it is thought that the mine will be in condition to keep it running night and day in about four months.— The Gold Nugget has arranged for the installation of machine-drills.

TELLER COUNTY

The Savage Leasing Co., operating the properties of the Requa-Savage Gold Mining Co. in the Cripple Creek district, is reported to have found a better grade of ore by extending one of the old drifts in the old workings a short distance beyond the barren portion of the vein and is again shipping.——Jesse Adams and associates, who have a lease on the Carper shaft from the Free Coinage Gold Mining Co., have opened a shoot of ore on the contact of a basalt dike and a breccia. The gold is coarse and panning freely. — The drift on the 500 ft. level of the Jefferson mine in Victor opened a shoot of ore 250 ft. north of the shaft from which assays running as high as $650 per ton were obtained. — The Holberg & Morgan lease on the Ajax is operating on the 100 and 300 ft. levels and shipping 15 tons of ore per day that assays from $40 to $60 per ton.

IDAHO

ELMORE COUNTY

The vein of hematite which was opened on the 200 ft. level of the Pittsburg & Idaho near Gilmore has been proved to be 20 ft. wide and to assay $8 per ton in gold. — At the Iron Mask several hundred feet of development has opened a vein that assays 7% lead with a small amount of silver. — The adit on the Idaho claim of the Sharkey-Kelly group is now in 150 ft. and is expected to intersect the vein within the next 75 feet.

SHOSHONE COUNTY

An assessment of one cent per share has been levied on the stock of the Copper King Mining & Smelting Co. at Mullen to raise money for the completion of the 4500 ft. adit that will tap the vein 1000 ft. below the old workings. On June 1 there remained 1166 ft. more driving to reach the vein, which is thought will be completed by the end of the year.

MISSOURI

JASPER COUNTY

(Special Correspondence.) The Center Creek Mining Co., one of the largest land owning companies in the district, has followed in the foosteps of other large companies near Joplin and is undertaking the development of the lower levels, most of which have hitherto been untouched. — —The Little Mary, a new company operating on lands adjacent to the Quick Seven tract at Neck City, is rapidly becoming an excellent producer. The ore is high grade and abundant, resembling in all respects the famous run of the Quick Seven. A considerable amount of drilling has found the land well mineralized, not a single blank hole being drilled. The ore for the present is being cleaned on hand jigs and is as rich as 40% in some instances. The contract for a mill has been let and a second shaft will be sunk at once. The Quick Seven mine has struck a layer of coal above the ore level and is using the coal for fuel at the mine and selling it to other companies. Usually the coal veins struck in this county are not of good quality, but the grade of this and the run found on the Whitworth farm is much better than ordinary and finds a ready market.

Joplin, July 1.

NEVADA

ELKO COUNTY

(Special Correspondence.) Three new discoveries at Jarbidge have been made the past week. The Riddle-Corrigan lease has cut the vein and it is 4 ft. wide, showing an average value of about $30 per ton, with streaks of high grade that run over $1000. This lease is on the Pavlak vein, about 300 ft. north of the 4-M lease. Good milling ore has been found in several places along this vein, but only one lessee had cut the high-grade. Of equal importance are the two discoveries about three miles east of the Pavlak vein. These were found in the Basin just east of Jarbidge peak, at the head of Jack creek, in what is called the Big Crater. These veins are about 130 ft. apart and quite different in the character of their quartz. They are both about the same size as far as uncovered along the surface, where they show from one to two feet of quartz containing free gold. The Van Alder vein is different from any before found; it is a white ribbon quartz with free gold, the average value being about $20 per ton, with no streaks of high grade showing on the surface. The other vein has a flinty quartz with streaks of brown decomposed granular quartz. Samples of the best ore gave returns of $441 to $2700 per ton. The quartz in this vein is similar to that found in the Pick & Shovel, Good Luck, and Free Gold claims. A company is being organized for the purpose of

erecting a custom mill here as soon as possible, and the Pavlak company is considering the erection of a mill at an early date.

Jarbidge, June 30.

ESMERALDA COUNTY

(Special Correspondence).—The production of the Goldfield district during the first half of the year 1910 was considerably in excess of $7,000,000, and it is estimated that even in the absence of further discoveries the total output for the year will exceed $16,000,000. This takes into account the fact that the Consolidated company has been operating for the past three months at greatly reduced mill capacity, that the Florence Goldfield has been treating low-grade ore as a considerable proportion of its product and will soon be in condition to increase its net output, that the Combination Fraction, after nearly a year in which no production has been made, has resumed milling operations

The Counties of Nevada.

with the certainty of a large output, and the further fact that several leasing projects are developing orebodies of proved value.——Three sets of lessees are operating on the Roseberry Rawhide group. The Veroqua lease is driving from the 200-ft. level to tap the vein opened near the surface, the Schmidt-Loufek lease is shipping small quantities of ore assaying about $30 per ton to the National mill, and the Rex is producing small consignments of shipping ore. ——The St. Ives lease on Queen has struck 6 in. of free-milling ore on the 400-ft. level.——The Grutt-Balloon Hill lease is developing a vein of rich silver ore and making occasional shipments to the Hazen sampler.——The Miller lease on Coalition is shipping 500 tons of ore to the Victor mill.——At the Pittsburg-Silver Peak, the 120-stamp mill is operating steadily and treating 15,500 tons of ore per month. The cost-sheet for May displays total expenses of $2.70, including 20c. per ton for repayment of funds expended in the purchase of the 20 additional stamps.——The Blair Salt Producers' Association is building vats and arranging to mine the salt beds near Blair.

Goldfield, July 1.

NYE COUNTY

(Special Correspondence).—The mill of the Tonopah Mining Co. is producing approximately $85,000 per week, 3400 tons of ore being handled in this period.——The Tonopah Extension Co. is arranging to exploit the recently acquired Red Rock and McKane group. An 82-hp. electric hoist is being installed to replace the steam-hoist.——It is reported that plans are under way for the flotation of a $200,000 bond issue with which to resume operations at the Lodi mines, in the northern portion of this county.——Minority stockholders of the Manhattan Dexter Co. have filed an amended complaint with Judge Mark R. Averill in which the officers are charged with mismanagement of the property, and an election asked for under the supervision of the Superior Court. Lessees have filed suits against the company because their leases have been declared forfeited, and the affairs of the company appear badly tangled. The mine is idle.

Tonopah, July 2.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence).—The vein on the sixth level east of the Socorro mines at Mogollon continues to widen as it advances toward the Queen lode. The vein in the breast of the drift, which is now 750 ft. below the surface, is 14 ft. wide and assays $32 per ton. When the drift is under the deepest portion of the hill 900 ft. of backs will have been obtained.——The Ernestine Mining Co. has secured a bond on the Top mine, the consideration being $350,000 worth of the Ernestine stock.——The 400-ft. station at the Deadwood has been completed and the shaft sunk 26 ft. below this point.

Mogollon, July 1.

OREGON

BAKER COUNTY

At the Union mine in the Cornucopia district the 20-stamp mill is running on ore that averages $15 per ton. The saving is made by amalgamation, concentration, and cyanidation. The Queen of the West in the same district has a 10-stamp mill in operation, 40% of the saving being on the plates. The concentrate is hauled to the railroad and assays $110 per ton. The ore is carried to the mill by an aerial tramway, the hauling, shipping, and smelting charges amounting to $25 per ton. It is reported that a cyanide plant is to be installed. F. J. Eitel is in charge. ——The adit at the Dewey group of claims, which is now in 150 ft., is to be driven an additional 50 ft., which is thought to be sufficient to intersect the vein.——D. L. Killgore, I. J. Leach, and J. A. Dygert have secured a lease on the Oro Fino group and will drive a 125-ft. adit to tap the shoot from which some rich ore was shipped to the Sumpter smelter.

UTAH

BEAVER COUNTY

During the month of June the Moscow Mining Co. in the Star district shipped 9 carloads of ore which was valued at from $30 to $40 per ton. The assays ran: lead, 30 to 50%; silver, 25 to 45 oz. per ton; and copper, 1½ to 4%. Recently a large orebody was opened by the 400-ft. shaft and a drift is being run on the 300-ft. level to connect with the same shoot.——The Commonwealth Mining Co. is to increase its force and continue work in the 100-ft. winze that was sunk from the 500-ft. level.

JUAB COUNTY

The Crown Point company, which owns a group adjoining the Colorado and Iron Blossom mines, is to resume active work on the property and will install electric-hoisting machinery. The shaft will be sunk from the 400-ft. level and the drift on that level driven on the ore.——The Coin Mining Co. has been incorporated to take over claims in the Tintic district that cover 160 acres.

SUMMIT COUNTY

The Silver King Consolidated is driving and raising on the 1550-ft. level, opening ore that assays $70 per ton. No effort is being made to get out ore for shipment, only that being forwarded to the smelters that is taken out in the development. Recently an orebody was opened that assayed

67% lead, 102 oz. silver, and $5 gold per ton. Work is progressing satisfactorily on the 100-ton mill that is being erected by the Little Bell Consolidated Mining Co. at Port Orchard. There are 40 men working at the mine and the management hopes to have the mill in operation some time in August. The Little Bell is shipping from 100 to 300 tons of first-class ore per month and stoping the second class at the mine, 2,000 tons now being on the dumps.

OKANOGAN COUNTY

A new 250-gal. pump has been installed at the Ophir Hill mine that will be able to handle the flow of water that drove the men out of the mine some time ago and has kept a portion of the mine flooded ever since. It will take about a month to completely unwater the mine, when a large force will be put to work and sinking continued in the 600-ft. incline. The ore is lead-silver, with a little copper, and for the past eleven years approximately 4000 tons per month has been shipped. The Silver Island Coalition has completed the installation of an air compressor and good progress is being made in the lower adit. A small shipment of ore that is worth about $150 per ton is ready to be forwarded.

WASHINGTON

CHELAN COUNTY

The Wenatchee mine, situated 2½ miles from Wenatchee, owned by H. Leighton and F. E. Tift, of Seattle, has been equipped with a mill of six Nissen stamps, 1800 lb. each, and amalgamating plates, to operate on a low-grade free-milling ore. I. F. Laucks, of Falkenburg & Laucks, Seattle, is at the property in a consulting capacity. The plant, which was installed by Fairbanks, Morse & Co., is for preliminary work, and it will be enlarged if tests shall demonstrate profitable operations.

SNOHOMISH COUNTY

(Special Correspondence).—The Washington & Iowa Copper Mining Co. has done 2000 ft. of development on its claims situated 14 miles northwest of Index. It is claimed that four lodes have been intersected by a 1200-ft. cross-cut and that 400 ft. of driving has been done on these. The cross-cut opens the fourth lode at a depth of 1800 ft. The ore consists of sulphide of copper, iron, lead, and zinc, in a quartz gangue, containing gold and silver. The veins are said to be in a granite and porphyry formation. The property is on the north fork of the Skykomish river, in Silver Creek mining district. G. A. Rinehart, E. P. Hewitt, and N. B. Evans are among the interested parties. The equipment includes an air-compressor and drills.

Index, July 1.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—During May the value of the product of the plant of the Consolidated M. & S. Co. of Canada was $575,582, making a total for eleven months of the company's fiscal year of $5,420,737, as compared with $4,876,000 for the same period during the prior year. For the fiscal year ended June 30, 1909, the output was $5,506,000. This plant has produced $43,000,000 in the precious metals since it was started in 1894.——Another dividend of 50c. per share has been declared by the Le Roi No. 2, Ltd., and will be payable July 8. This property has paid dividends regularly, the total now amounting to something like $1,033,200. The property is equipped with an economical plant, and development and ore reserves are kept well ahead. This company shipped 2530 tons of select ore during May, and 136 tons of concentrate. The smelter receipts were $17.50 per ton for the ore and $17.93 per ton for the concentrate from second-class ore.——The Velvet-Portland mine has again been leased by E. Ehrenburg of Spokane, who made considerable money from his lease last year. Work will be started immediately.——The Rossland office of the Van Roi Mining Co. has trasmitted to London the information that during May the shipments from the property were confined to 220 tons concentrate and return from the smelter was on the basis of $103 per ton. The mill crushed 1,109 tons yielding 150 tons lead concentrate which assayed [illegible] oz. silver, 61% lead, and 17% zinc, and 100 tons zinc concentrate assaying [illegible] oz. silver, [illegible]% lead, and 14% zinc. Zinc shipments from the property were delayed owing to a shortage of cars. A plan of diamond drilling is being carried out at the mine which will shortly be completed.——The new 10-drill compressor at the No. [illegible] mine of the Consolidated company was started last week and active development of the mine with machine drills will now commence. The four-mile tram is nearly completed and the surface plant about the property is in condition for quick and economical handling of the ore. Fifty men are at present employed.——At the Rawhide mine of the New Dominion Copper Co. a double shift was put to work during the past week, making over forty men now employed. The force will be gradually increased as experienced men can be obtained, good miners being scarce in this district just now.

Work on the Greenwood-Phoenix tunnel is temporarily suspended, but it is announced that operations will be resumed shortly.

Rossland, July 2.

YUKON TERRITORY

The Yukon District Gold Mining Co., operating in Windy Arm district, 12 miles from Carribou, has 40 men at work this season, and is making regular shipments of ore to the Tacoma smelting plant. The last shipment of 62 tons of ore sampled 1.11 oz. gold, 129.5 oz. silver, and 13% lead. The net return amounted to $89 per ton. A Canadian Rand air-compressor and drills were installed last spring. Some shipments were made during the winter, the ore having been hauled over the ice to Carribou station. Shipments are expected to continue during the summer by boat to the railroad. J. H. Conrad, E. E. Harvey, and others are interested in the property.

MEXICO

MEXICO

Walter Pentland, for many years in the employ of the El Oro Mining & Railway Co., has been engaged by the Seguranza Mining Co. to take charge of its mill and cyanide plant. Practically all of the material for the tanks is now on the ground, the foundations for the cyanide tanks are all completed, and it is expected that within a short period the company will commence to treat the large amount of tailing which has accumulated since the concentrating plant was started some months ago. At the present time this company has stored in its El Bobo patio about 600 tons of milling and high-grade ore, treatment of which has been delayed, due to lack of transportation facilities to the hacienda, which lies on the opposite side of the mountain. To overcome this difficulty, rails have been ordered for a mule-car line, which will be constructed to the mouth of the No. 6 winze on the Coronas level, where all ores mined in the El Bobo level will be dumped, to be taken from chutes on the Zaragoza level below, until such time as the drift to the north on the No. 4 vein (Zaragoza level) can be connected with the winzes of the El Bobo level, when this transportation cost will be done away with. The Chontalpan mine, lying just across the State line in Guerrero, is producing large quantities of shipping ore. Machinery for hoists, drills, and pumps is arriving, being brought in by way of San Juan de las Huertas and Sultepec. The power to be used is producer gas. Arturo Bittner is in charge of the mine.

SONORA

The Sonora Central Mines Co., operating the Santo Domingo mine, lying between the Quintera and Zambona mines, Alamos, is erecting a concentration plant to mill the orebodies opened with 3000 ft. of development during the last year under the management of James R. Hendra. The Santo Domingo mine is one of the most noted antigua mines in the Alamos district. A 10-stamp mill constituting the first unit of the plant will be completed and in operation within 60 days. The mine is opened up to the third level and the main working shaft is being sunk to a depth of 500 ft., on completion of which it is proposed to add to the first unit sufficient stamps to give a capacity of 200 tons per day.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

S. J. Speak is visiting Australia.

W. A. Prichard is in San Francisco.

W. F. Thomae has been in New York.

Gelasio Caetani has gone to Arizona.

Frank H. Probert has been in Boston.

Claude T. Rice, of Salt Lake, is in San Francisco.

H. W. Turner has returned from British Columbia.

Fred B. Reece is at Hostotipaquillo, Jalisco, Mexico.

J. M. Bell has been visiting Queensland and Tasmania.

Francis Drake has returned from southern California.

E. S. Bastin was married at Eastport, Maine, June 30.

E. F. Burchard was married at Evanston, Illinois, recently.

Henry A. Judd has gone to northern Nigeria for Lake & Currie.

J. A. Agnew, of Bewick, Moreing & Co., is expected in Canada.

George Otis Smith has been made Acting Director of the Bureau of Mines.

Edward Hooper, of Hooper, Speak & Williams, has gone to Western Australia.

L. C. Graton will spend part of July and August in the Shasta county copper region.

E. E. Powell, of the Nome Mining Co., started from Seattle, July 3, for Nome, Alaska.

Corry C. Brayton has returned to San Francisco from examination work in New Mexico.

Critchley Parker will soon be in the United States on his way from London to Australia.

Frederick H. Morley, of Denver, has gone to Vancouver, B. C., to examine mining properties.

Donald F. Foster is metallurgist for the Torres Mines, Ltd., Cherokee, Guadalupe y Calvo, Mexico.

Fred L. Lowell and Norman C. Stines sailed on the Chiyo, July 6, on their way to Vladivostok.

Chester F. Lee, of Seattle, and associates are developing a mining property in Siskiyou county, California.

Ernest Williams has resigned the position of manager for the Great Boulder Perseverence and is going to Africa.

Andrew G. Larson, consulting engineer for the Le Roi mine, has opened an office at Vancouver, British Columbia.

H. H. Claudet recently returned to Vancouver, British Columbia, from Stewart district, adjacent to Portland Canal.

Louis S. Cates has accepted the position of superintendent of mines for the Ray Consolidated Copper Co. at Ray, Arizona.

A. D. Gassaway has returned from London and Siberia where he has been for a year and a half for the Lena Goldfields.

Harrison F. Harvey, of Seattle, has established an assay office at Stewart, B. C., which is the center for the Portland Canal mining activity.

The San Francisco Section of the Mining & Metallurgical Society of America will hold its next meeting at Grass Valley, July 22 to 24.

R. T. Wilkes has left for El Rayo Mining & Development Co. at Santa Barbara, Chihuahua, Mexico, and will be at Chamberino, Mexico.

Charles S. Vogelsang, president of the Constant Herzog Co., has left New York for an extended trip to the Western States on professional work.

Cecil Kay has returned from New York and will leave in a few days for Hermosillo, Mexico. He has received the appointment of general manager for the Pacific Smelting & Mining Co. and he also becomes president of the Mexican subsidiaries of that company.

Universities and Mining Schools

Will. H. Coghill, of the Ore Testing Laboratory of Northwestern University, has developed a method of treatment for refractory manganese-silver ores.

Robert H. Richards, professor of mining at the Massachusetts Institute of Technology, accompanied by the mining students left for the summer school trip on June 10. The trip included a visit to the Michigan copper mines, the nickel mines at Sudbury, and the silver mines at Cobalt.

C. W. Hall, for many years professor of geology at the University of Minnesota, has retired. In connection with the appointment of his successor considerable re-organization in the department is expected and possibly arrangements will be made to revive the State Geological Survey.

L. S. Griswold has resigned the chair of geology at the Missouri School of Mines and will devote his entire time to consulting work. Guy Henry Cox, formerly assistant professor of mineralogy and petrography, has been placed in charge of the department of geology and mineralogy and raised to the rank of professor. J. W. Eggleston has been appointed to fill the position left vacant by the promotion of Mr. Cox. He is a graduate of Amherst, and of Harvard, and has had considerable experience in teaching geology and mineralogy in the Colorado School of Mines and Harvard University.

University of Alabama authorities during the recent commencement week, formally received two new buildings, Smith Hall, devoted to the studies of geology and biology, and Comer Hall, devoted to engineering studies. The dedicatory address for Comer Hall was delivered by F. H. Crockard, first vice-president and general manager of the Tennessee Coal, Iron & Railway Company, and for Smith Hall by J. A. Holmes, of the Technological Division of the United States Geological Survey. Smith Hall has been named in honor of Eugene A. Smith who has been professor of geology since 1871 and State Geologist since 1873.

The Trustees of the University of Pittsburg have adopted a plan of co-operation which will be put in operation this October, requiring the students of the colleges of civil, mechanical, electrical, chemical, and sanitary engineering to spend three months of the year in work outside of the university. They will be responsible to their employers and will receive the regular wages for the labor performed, but will have to report every two weeks to the college authorities. It is believed that this will enable a number of students to earn a large portion of their expenses while attending the university, to come in contact with firms that are employing engineers, and will place them in close touch with business principles and organization. The University of Pittsburg because of its industrial environment, is splendidly situated to carry on this work and a number of local firms have made arrangements to co-operate with the colleges.

The Fritz Engineering Laboratory and the Eckley B. Coxe Mining Laboratory, of the Lehigh University at South Bethlehem, were formally opened June 11. The funds for the construction of the Fritz laboratory were donated and the plans drawn by John Fritz known as the father of the steel industry in the United States, and a member of the board of trustees of the university. The building is of modern steel frame construction, and contains a 200 ton shear equipment for testing strength of materials and hydraulic apparatus for the study of problems in hydraulics. The Eckley B. Coxe Mining Laboratory is built of sandstone and is named in honor of Eckley B. Coxe, a mining engineer and trustee of the university in its early days. The main part of the building contains the ore-dressing laboratory, 40 by 70 ft.; the west wing contains a chemical laboratory, an assaying room, and a shop; and the east wing the office and recitation room. The locker and wash room is in the basement of the east wing. The equipment of this laboratory consists of stamps, amalgamating plates, grinding pans, rolls, gyratory crusher screens, jigs, Huntington mill, classifiers, concentrators, and a cyanide plant.

Publications Received

[illegible] of Mines, Mr. [illegible], A Report [illegible] Mining Statistics [illegible] Price $.

The [illegible] of Iowa is continued in [illegible] developed in [illegible] Mr. [illegible] [illegible] adapted to [illegible] to give them a [illegible] of view. While occasionally [illegible] and [illegible] to [illegible] prove useful.

Iron Ores of Missouri. By E. O. Hovey, J. L. Rich, A. C. Spencer, and Sidney Paige. U. S. Geol. Surv., Advance Chapter from Bull. 430-E. Pp. 59. Washington, 1910.

This is a section of the Contributions to Economic Geology for 1909 and includes reports of iron ore deposits in California, Nevada, Pennsylvania and Texas.

Surface Water Supply of the United States, 1909. Part IV. St. Lawrence River basin. By H. K. Barrows, A. H. Horton and R. H. Bolster. U. S. Geol. Surv., Water-Supply Paper 248. Pp. 90. Washington, 1910.

Monthly Copper Review

*Misha L. [illegible]

The copper market for the month of June has, on the whole, been a steady one, electrolytic selling as low as 12¾c delivered, 30 days, and as high as 12⅞c. Domestic manufacturers continue their policy of buying from hand to mouth and since the production shows no signs of decreasing there is little incentive for them to change such policy. European shipments have been large and the metal has gone direct into manufacturers hands, for the key to the whole situation is the production. If production and deliveries continue at the present rate we are not likely to see any betterment in the copper prices, since that would not leave any room for reduction in the several hundred million pounds on hand now. It seems to me that the producers of copper are now realizing the necessity of taking less copper out of the ground instead of impoverishing the mines at a time when the price of copper leaves such scant profits, and I will not be at all surprised if several of the producers individually decide upon curtailment. It would be out of the question to have a general agreement to curtailment, since that would be contrary to the spirit of the law.

Deliveries for June will show for export about fifty million pounds, and with sixty five million pounds domestic will equal the production, that is, within a few million pounds, and considering that Europe has decreased a smaller amount, total deliveries exactly equal the production.

*President New York Metal Selling Company.

German Copper Statistics

L. Vogelstein & Co. give the following figures of German consumption of foreign copper for the months January to May, 1910:

	Tons.
Imports of Copper	69,700
Exports of Copper	3,312
Consumption	66,388

The consumption during the same period in 1909 was 62,709 tons. Of the above quantity 61,451 tons were imported from the United States.

Dividends

On Tuesday, July 5, the Bunker Hill & Sullivan M. & C. Co. paid dividend No. 154 of $98,100. This makes the amount of dividends paid since January 1, 1910, $549,300, and the total to date $11,835,300.

Market Reports

LOCAL METAL PRICES

San Francisco, [illegible]

Antimony	11-12½c	Quicksilver flask	[illegible]
Electrolytic Copper	13½-[illegible]c	Spelter	[illegible]
Pig Lead	4.[illegible]-5.00c	Tin	[illegible]

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead	Spelter	Silver per oz
June 30	12.[illegible]	4.[illegible]	[illegible]	[illegible]
July 1	12.[illegible]	4.[illegible]	[illegible]	[illegible]
" 2	12.[illegible]	4.[illegible]	[illegible]	58
" 3	Sunday	No market		
" 4	Holiday	No market		
" 5	12.[illegible]	4.[illegible]	[illegible]	[illegible]
" 6	12.[illegible]	4.[illegible]	[illegible]	[illegible]

ANGLO-AMERICAN SHARES

Cabled from London

	June 29 £ s. d.	July 7 £ s. d.
Camp Bird	1 7 6	1 [illegible]
El Oro	1 7 3	[illegible]
Esperanza	2 17 0	2 [illegible]
Dolores	1 7 6	1 [illegible]
Oroville Dredging	0 6 6	[illegible]
Mexico Mines	9 5 0	[illegible]
Tomboy	0 17 6 ex div.	0 [illegible]

By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.

COPPER SHARES, BOSTON

	Closing prices, July 7		Closing prices July 7.
Adventure	5	Mohawk	47
Allouez	65/8	North Butte	22
Atlantic	4	Old Dominion	43½
Calumet & Arizona	60	Osceola	120
Calumet & Hecla	590	Parrot	12
Centennial	14¼	Santa Fe	1
Copper Range	60	Shannon	9⅜
Daly West	7	Superior & Pittsburg	10
Franklin	9¼	Tamarack	48
Granby	28	Trinity	5¼
Greene-Cananea, ctf	6⅞	Utah Con	20
Isle Royale	14¼	Victoria	2⅜
La Salle	10	Winona	6
Mass Copper	7	Wolverine	102

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, July 6.		Closing prices, July 6.
Amalgamated Copper	58¾	Miami Copper	18
A. S. & R. Co.	67⅝	Mines Co. of America	⅞
Boston Copper	18⅛	Montgomery-Shoshone	⅜
B. C. Copper Co.	5	Nevada Con.	17⅝
Butte Coalition	16⅛	Nevada Utah	⅞
Chino	10⅜	Nipissing	10⅞
Davis-Daly	1	Ohio Copper	1⅜
Dolores	6	Ray Central	2¼
El Rayo	3⅛	Ray Con.	16⅛
Ely Central	⅞	South Utah	1⅛
First National	3⅛	Superior & Pittsburg	9⅝
Giroux	6⅜	Tenn. Copper	25⅛
Guanajuato Con.	1	Trinity	4¼
Inspiration	7	Tuolumne Copper	2¼
Kerr Lake	8	United Copper	4¼
La Rose	4¼	Utah Copper	41
Mason Valley	6⅞	Yukon Gold	4

SOUTHERN NEVADA STOCKS.

San Francisco, July 7.

Atlanta	$ 12	Mayflower	$ 3
Belmont	3.65	Midway	24
Booth	13	Montana Tonopah	98
Columbia Mtn.	6	Nevada Hills	1.85
Combination Fraction	50	Pittsburg Silver Peak	65
Daisy	6	Rawhide Coalition	15
Fairview Eagle	30	Rawhide Queen	28
Florence	2.15	Round Mountain	45
Goldfield Con.	8.95	Sandstorm	4
Gold Kewenas	6	Silver Pick	6
Great Bend	3	St. Ives	11
Jim Butler	27	Tonopah Extension	78
Jumbo Extension	25	Tonopah of Nevada	8.75
MacNamara	31	West End	55

(By courtesy of San Francisco Stock Exchange.)

OIL DIVIDENDS FOR JUNE, 1910.

From the Official Monthly Statement of Oil Securities of the San Francisco Stock Exchange.

Company.	Capital.	Shares issued.	Par value.	Acreage.	Location.	Dividend. Last date.	Amount per share.	Total to date.
Alma Oil Co	$100,000	380,000	$1.00	120	Kern River	4 15 '10	$ 3	$171,000.00
Amalgamated Oil Co	5,000,000	50,000	100.00	*	Salt Lake Field, L. A	5 15 '10	1.00	1,500,000.00
Amer. Petroleum (pfd.)	2,500,000	25,000	1.00	*	Coalinga and Sherman	6 1 '10	1.00	1,436,900.50
Apollo	500,000	200,000	2.50	40	Kern River	3 20 '10	1	4,000.00
Associated Oil Stock	40,000,000	400,000	100.00	*	Kern, Coalinga, McKittrick.	3 1 '07	1.50	1,518,368.54
Associated Oil Bonds 5s.	3,006,000	.....	....	*	Kern, Coalinga, McKittrick.	.....	....	.....
Bay City	500,000	100,000	5.00	200	Midway	6 10 '10	20	135,000.00
Blue Moon	200,000	189,759	1.00	20	Coalinga	.....	....	.....
Brookshire	500,000	500,000	1.00	933	Santa Maria and Midway	1 1 '10	1	442,500.00
California Midway	1,000,000	922,800	1.00	160	Midway	.....	....	.....
California Oil & Gas	1,000,000	900,000	1.00	80	Coalinga	.....	....	.....
Caribou Oil & Mining Co.	100,000	80,703	1.00	100	Coalinga	6 15 '10	25	761,058.99
Chicago Crude	1,000,000	1,000,000	1.00	100	Kern	3 25 '07	0½	15,000.00
Claremont	500,000	500,000	1.00	280	Kern and Coalinga	6 28 '10	2	355,000.00
Coalinga Central	500,000	450,000	1.00	120	Coalinga	.....	....	.....
Coalinga Pacific	165,000	65,000	1.00	40	Coalinga	12 23 '09	10	107,250.00
Columbia	1,000,000	999,226	1.00	*	Fullerton and Whittier	6 25 '10	½-½	354,774.73
Cresceus	320,000	320,000	1.00	40	Midway	.....	....	.....
Dabney	1,000,000	1,000,000	1.00	120	Midway	.....	....	.....
Del Rey	1,000,000	785,490	1.00	40	Kern River	5 15 '09	0½	11,782.50
De Luxe	100,000	100,000	1.00	40	Coalinga	.....	....	.....
Eldorado	100,000	100,000	1.00	10	Kern River	.....	....	.....
Empire	200,000	200,000	1.00	80	Coalinga	6 31 '10	....	4,000.00
Enos	500,000	358,500	1.00	220	Kern and Santa Barbara	.....	....	.....
Esperanza	160,000	160,000	1.00	170	Coalinga	12 27 '09	9	49,450.00
Euclid	350,000	350,000	1.00	10	Kern and Coalinga	6 1 '10	1	134,500.00
Four Oil	300,000	300,000	1.00	20	Kern and Coalinga	2 25 '10	1	213,000.00
Fulton	1,000,000	100,000	10.00	120	Sunset	.....	....	.....
Globe	600,000	600,000	1.00	20	Kern River	4 1 '10	1	87,000.00
Graciosa	1,000,000	1,000,000	1.00	*	Santa Maria	.....	....	.....
Home	100,000	100,000	1.00	140	Coalinga	6 20 '10	2	480,000.00
Homestake	100,000	10,000	10.00	160	Coalinga	4 14 '10	10	78,250.00
Illinois Crude	200,000	200,000	1.00	10	Kern River	6 1 '10	1	94,000.00
Imperial	500,000	100,000	5.00	2,480	Kern and Coalinga	6 18 '10	5.00	3,200,000.00
Junction	250,000	250,000	1.00	80	Kern River	6 1 '09	1	20,000.00
Kern River	100,000	20,000	5.00	80	Kern River	6 1 '10	10	106,000.00
Linda Vista	.....	385,850	....	20	Kern River	5 9 '10	1	76,770.00
Lucile	50,000	26,704	1.00	40	Coalinga	12 20 '09	10	42,727.04
Mascot	500,000	500,000	1.00	225	Midway	6 20 '10	1	25,000.00
McKittrick	500,000	500,000	1.00	1,200	McKittrick	.....	....	.....
Mecca	500,000	422,500	1.00	120	Kern River	7 15 '09	3	71,825.00
Midway of Oregon	1,000,000	1,000,000	1.00	640	Midway	.....	....	.....
Monte Cristo	500,000	500,000	1.00	80	Kern and Sunset	6 25 '10	10	540,000.00
Mountain Girl	350,000	350,000	1.00	*	Midway	.....	....	.....
Mexican Petroleum	50,000,000	10,000,000	5.00	*	Mexico	6 1 '10	1¼	3,734,193.64
M. & M	1,000,000	1,000,000	1.00	140	Maricopa	.....	....	.....
Nevada County	250,000	250,000	1.00	30	Kern River	10 13 '08	1	40,000.00
New Penn. Petroleum	500,000	500,000	1.00	147	Santa Maria	6 15 '10	1	5,000.00
Palmer	2,000,000	1,802,010	1.00	880	Santa Maria	1 20 '10	1	304,421.05
Paraffine	300,000	300,000	1.00	40	Midway	6 15 '10	1	24,000.00
Peerless	1,000,000	100,000	10.00	160	Kern River	9 20 '09	6	801,000.00
Piedmont	500,000	389,000	1.00	10	Kern River	5 9 '10	1	26,877.30
Pinal	200,000	150,000	1.00	*	Santa Maria	6 30 '10	10	932,077.50
Premier	1,000,000	1,000,000	1.00	160	Coalinga	6 20 '10	1	30,000.00
Producers	500,000	80,000	5.00	600	Midway	5 1 '10	1.00	80,000.00
Radium	250,000	250,000	1.00	*	Santa Maria	.....	....	.....
Record	200,000	100,000	2.00	40	Coalinga	6 16 '10	7½	77,500.00
Republic	600,000	500,000	1.00	80	Coalinga	.....	....	.....
Rice Ranch	300,000	300,000	1.00	40	Santa Maria	6 10 '10	1	108,000.00
Rico	100,000	100,000	1.00	60	Midway	.....	....	.....
Royalty	20,000	20,000	1.00	20	McKittrick	6 13 '10	1½	22,733.33
S. F. & McKittrick	500,000	50,000	10.00	151	McKittrick	6 1 '10	30	385,000.00
Sauer Dough	100,000	199,500	0.50	270	Coalinga and McKittrick	6 21 '10	2½	532,226.00
Section 7	400,000	400,000	1.00	65	Coalinga	.....	....	.....
Section 25	40,000	40,000	1.00	290	Midway	6 21 '10	25	40,000.00
Sesnon	100,000	100,000	1.00	35	Kern River	6 6 '10	8	126,000.00
Shawmut	500,000	500,000	1.00	*	Coalinga	.....	....	.....
Silver Tip	75,000	75,000	1.00	20	Coalinga	2 25 '10	10	30,000.00
Sovereign	500,000	500,000	1.00	20	Kern River	4 15 '10	1	95,000.00
S. W. & B	400,000	377,000	1.00	40	Coalinga	9 10 '09	1	41,470.00
State	100,000	100,000	1.00	20	McKittrick	.....	....	.....
Sterling	250,000	250,000	1.00	160	McKittrick and Kern	3 15 '10	12½	778,250.00
Sunset Monarch	500,000	497,241	1.00	*	Sunset and Midway	.....	....	.....
Superior	500,000	500,000	1.00	40	Sunset	2 12 '10	1	57,500.00
Thirty-Three	500,000	100,000	5.00	160	Kern River	4 6 '10	20	690,000.00
Traders	1,500,000	15,000	100.00	410	Kern, Coalinga and Midway	5 15 '10	1.00	209,146.50
Turner	500,000	500,000	1.00	320	Coalinga	.....	....	.....
United	.....	80,751	....	*	Controls Union	6 20 '10	50	2,300,086.46
Union	50,000,000	249,626	100.00	*	All Fields of State	6 20 '10	50	6,742,694.15
Wabash	500,000	300,000	1.00	80	Coalinga	6 16 '10	1	129,000.00
West Coast (com.)	2,500,000	10,408	100.00	*	Los Angeles	.....	....	.....
West Coast (pfd.)	2,500,000	10,408	100.00	*	Los Angeles	6 15 '10	2.00	104,080.00
West Shore	100,000	100,000	1.00	80	Kern River	12 21 '08	5	235,000.00
Wolverine	100,000	100,000	1.00	60	Kern River	.....	....	.....
W. K. Oil	500,000	500,000	1.00	320	Coalinga	.....	....	.....
Western Union	1,000,000	10,000	100.00	10,000	Santa Maria	4 15 '07	2.00	484,951.00
Hanford	.....	1,000,000	....	....	.....	1 30 '06	22	80,000.00
Kern Oil	.....	.....	.....	.....	.....	11 19 '09	21½	42,000.00
Pittsburg	.....	.....	.....	.....	.....	11 11 '07	43½	124,800.00
Reed Crude	.....	.....	.....	.....	.....	5 31 '10	....	1,167,500.00

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EDITORIAL

Announcement

The resignation of Mr Courtenay De Kalb has made necessary certain changes in our editorial staff. Mr De Kalb has been connected with the *Mining and Scientific Press* since 1907 as special contributor, associate editor, and finally as editor. He brought to the paper an unusually extensive personal acquaintance with Latin America, an intimate knowledge of mining, milling, and smelting, and an unfailing interest in legal problems relating to mines. His broad general knowledge and enthusiastic devotion to mining in every particular, has contributed greatly to the growth and influence of the paper. He leaves to become general manager for the Pacific Smelting & Mining Company which has large interests in Sonora, Mexico. Mr. De Kalb retains his interest in the paper, and will act as editorial contributor, so that our readers may anticipate hearing from him occasionally. There has been no change in ownership, and Mr. T. A. Rickard will, as in the past, contribute frequent articles and editorials, keeping our readers in touch with mining matters as seen in London. Mr. H. Foster Bain remains as editor, to be joined later by Mr. Thomas T. Read of the Imperial Pei-Yang University at Tientsin, China. Mr. Read is a mining engineer and metallurgist well known for excellent work in Colorado and the Far East. He has traveled extensively in China, Japan, and Manchuria, and before taking up his duties at San Francisco will spend some months studying the principal gold mining regions of the world. More complete announcements will be made later. In the meantime Mr. W. H. Storms, at various times in the past connected with the editorial staff and recently superintendent for the California Consolidated Mines Company, will temporarily assist in the editorial work.

AMONG coal trade journals *The Black Diamond* of Chicago is one of the best. Its increasing and deserved prosperity is reflected in the excellent special number with which it celebrated its twenty-fifth anniversary July 2.

CLAIM JUMPING on a large scale is said to be impending in the Midway oil district of California where recent investigations are reported to have shown much land to be held improperly. This is a striking commentary on the inadequacy of the present oil-land laws. Now that prices of oil have dropped a little and development is not so swift, it would be economical for the oil men to get together on a plan for a rational revision of the law.

FINAL PLANS for the Canal Zone meeting of the American Institute of Mining Engineers have now been announced. The party will leave New York October 29, returning about November 25 and visiting Havana, Kingston, and other West Indian ports en route. As accommodations are limited reservation should be made promptly.

THE International Congress of Mining, Metallurgy, Applied Mechanics, and Practical Geology at Düsseldorf, Germany, June 20 to 23, was well attended and particularly well managed. The discussions and papers were numerous and valuable. Interest centred in coal, iron, and steel as would be but natural in a meeting held at the home of the German Steel Syndicate.

DISCUSSIONS during sessions of the American Chemical Society meeting in San Francisco this week have been both interesting and helpful. Of especial interest to metallurgists was the symposium on smelter smoke which was on the program for Thursday morning. Of this we will give more account later. Friday the members of the Society visited the plant of the Selby Smelting & Lead Company where such excellent work has been done in solving the smelter smoke problem.

RECENT tests of the evaporative power of California oil under boilers at various points on the Isthmus of Panama have shown a minimum of 7.12 pounds of water per pound of coal, from and at 212° F., and a maximum of 14.22. The average was 12.31, and the majority of the tests gave results near this average despite great variety in the types of boilers. Even at the minimum efficiency, oil at $1.10 per barrel is cheaper than Pocahontas coal at $6.25 per ton, the price obtaining at most Isthmian points.

FROM an article on silver production at Cerro de Pasco, Peru, by Mr. Lester W. Strauss, which appeared in the *Inca Chronicle* of May last, we learn that the total output from the wonderful mines in and around that city of the clouds has amounted to three hundred million ounces of the white metal. The highest production for any single year was 3,100,000 ounces in 1842. At present silver ore is no longer treated in the native *ingenios*. The high-grade ores, containing more than 70 per cent silica and exceeding 30 ounces silver, are sold to the Cerro de Pasco company for converter lining.

PLANS for the work of the State Geological Survey of Tennessee have been announced and are excellent. The Survey is organized on a non-political basis, the Commission consisting of the Governer, Commissioner of Agriculture, Chief Mine Inspector, President of the University of Tennessee, and Chancellor of Vanderbilt University. As associates to the State Geologist, Mr. George H. Ashley, Mr. L. C. Glenn of Vanderbilt University and Mr. C. H. Gordon of the University of Tennessee, have been selected. Both these gentlemen are excellent geologists, and the plan secures to the Survey a close connection with the Universities at the same time that it remains independent, the offices being at the State Capital. A considerable amount of work is already under way in co-operation with the United States Geological Survey, the Department of Agriculture, and other Government agencies, thus not only supplementing the State's funds, but securing most effective correlation of studies. Thorough work is evidently to be done and a plea has been made for time before publication be demanded. In the meantime studies of oil and gas, of the Ducktown copper deposits, and of other resources are going forward in competent hands. An exhibition of the resources of the State will be made at the Appalachian Exposition at Knoxville, September 12 to October 12, and in every proper way the new organization will bring the light of science to bear on the problems of development of the State's resources. The thoroughness with which the preliminary work is being done augurs well for the results.

Bureau of Mines and Its Critics.

A recent editorial in the usually accurate and informed *Engineering Magazine*, forecasts dire results from the organization of a Bureau of Mines. In this instance our contemporary is seriously misinformed as to facts. How the conclusion is reached that the new Bureau is to be "distinctively administrative, regulative, apparently a part of the inquisitorial and hostile attitude toward corporations which is now so popular," is not apparent. Certainly no such conclusion can be drawn fairly from a reading of the law establishing the Bureau. This requires that the Director shall be a technical man and the technologic character of the investigations is not only emphasized directly in the wording of the act, but indirectly by the transfer to the new Bureau of the Technologic Branch of the Geological Survey. It should be noted that the statistical work was not so transferred nor was any of the work of any of the Bureaus of the Department of Commerce and Labor. There is written into the law an express disclaimer of any authority in the matter of mine inspection, and in every reasonable way, as it seems to us, it was made clear that the Bureau of Mines is to be a technical investigative organization, designed to take up the problems of mining at the point where the proper activities of the Geological Survey ceased. There has been persistent effort to misrepresent the facts in this particular and we are sorry to see that the *Engineering Magazine* has been made a victim. We furthermore differ as to the "political origin and character of the Bureau" or the "extremely small part, if any, that has been taken by representative mining men, responsible mining interests, or the representatives of distinctive mining States, in the demand for the establishment of the Bureau." Again we say our contemporary is clearly misinformed, as a perusal of our own news columns will show. It is true that a considerable number of mining men and mining engineers resident in New York have opposed the establishment of the Bureau or been lukewarm in its support. In this, as in some other things, New Yorkers have confused their own opinion for that of the country at large.

Growth of Reverberatory Smelting

Reverberatory smelting of copper ores is becoming more general in this country. The success attending the use of furnaces of this type already in operation at Garfield has led to the building of an additional furnace which will soon be placed in commission. This practice is the result of demonstrated economies in operation. If water-power were available the same commercial advantage would not obtain. It is mainly because the waste heat can be utilized in the development of power that the reverberatory shows marked economy as contrasted with the blast furnace. As shown in a recent article published in these columns 0.77 barrel of oil is burnt in the fire-box for every ton of charge smelted. Of this amount only 0.33 barrel is chargeable to actual smelting while 0.44 barrel represents recovery in the form of steam generated in the boilers through which the flue-gases are conducted. At Anaconda and Salt Lake a like warrant for employing the reverberatories exists. An additional advantage consists in the greater flexibility of the reverberatory in taking care of sudden changes in the composition of the charge. The blast-furnace needs to be operated with great uniformity in order to yield the best results. Though it can be operated with wide variations in the percentages of silica and bases it is not economical when sudden changes occur. This statement may be debatable, but there is no doubt that the reverberatory is less sensitive in this regard. On the other hand it is true that the reverberatory will successfully smelt fine ore and flue-dust, while these materials when put into the blast-furnace produce an excessive amount of flue-dust, and herein lies another reason for the rapid growth in favor of the former type of furnace. The present situation of the custom copper smelters inclines the balance in the same direction. The quantity of concentrate offered is steadily increasing, while smelting ores are becoming scarcer. Furthermore silicious ore is not so abundant as formerly, because of the expansion of milling and other forms of local treatment. Basic ores usually make considerable fine material, and this is not adapted to the blast-furnace. Thus the reverberatory finds a large field of usefulness, in spite of the fact that it is more particularly applicable to charges of relatively high silicious content. It is easier to secure a serviceable acid than a basic fettling, and the dust from basic charges tends to corrode the arch and walls. The utilization of highly silicious fine ore has been suggested as a means of overcoming this difficulty, the plan being to introduce a certain amount of such material at the beginning of each charge so as to give the arch and walls a protective coating of acid dust. Less basic dust would then adhere, and corrosion would probably be lessened.

It is stated that the Garfield smelter near Salt Lake may soon be using reverberatory furnaces almost exclusively. An addition to this part of the plant is already being made. This is being done in anticipation of the larger deliveries of concentrate from the Utah Copper Company's mills that will follow the reconstruction of the mill acquired from the Boston Consolidated. At the same time it is noteworthy that other custom ores are not being offered in such abundance to the Garfield smelter as to insure a supply sufficient for its blast furnace plant. The new smelter of the International Smelting & Refining Company in Pine Canyon contains five reverberatories and no blast furnaces. This is the first large plant to be constructed in America in which blast furnace smelting plays no part. The reverberatories at Pine Canyon are 102 feet long, by 19 feet wide, and each will treat about 250 tons of charge per diem. It will be noted that the length of the furnace is less than that of the old furnaces at Anaconda, and it is considered open to question whether even this length is not greater than is actually required for economic work. There is a limit of size beyond which no gain is experienced. In the opinion of some experienced metallurgists no advantage is obtained by making a reverberatory longer than 80 or 85 feet. The smelting is finished at that distance from the fire-bridge, the remainder of the hearth serving only to admit of further separation of matte from the slag, and it is doubtful whether equally good results might not be obtained in a shorter furnace. This would apparently render it possible to recover a larger amount of heat from the waste gases, and make the smelting costs proportionally less. The Pine Canyon smelter, while built primarily to treat the ores of the Highland Boy mines, will also do general custom work. This makes all the more interesting the fact that no blast-furnace smelting will be attempted. All ores received will be crushed in the sampling mill to a maximum size of $\frac{5}{8}$ inch. The crushing plant is exceedingly compact, and contains Blake crushers and rolls exclusively. The converter house contains one stand for each reverberatory, but it is doubtful whether more than two converters will be required. The furnaces and converters are all connected to a dust chamber 120 by 140 feet, and 40 feet high, the roof being of brick held by I-beams sustained by trusses on the outside, and further supported by steel columns surrounded by hollow masonry, the latter serving partly to keep the columns cool and partly to draw air into the tunnel beneath, where the dust will be dumped from hoppers into cars. The draft will be induced by a stack 350 feet high, $36\frac{1}{2}$ feet diameter at the base and 25 feet at the top.

The present tendency is distinctly toward a more extended use of the reverberatory furnace, and important developments in practice are likely to follow. Modifications in size and in the lines of the furnaces are to be anticipated, all having for an object the introduction of higher economy. Conditions in this country do not favor the adoption of the Mansfeld practice with tall blast-furnaces and a closed top. By that means the waste gases may be utilized for the development of power, and the dust losses are kept within narrower limits. In America, however, ores suitable for smelting under such conditions are not abundant, and the reverberatory seems to offer a better solution of the problem where dependence upon fuel instead of water-power is necessitated.

BY THE WAY.

Under the title 'A Man of the East and West,' Edgar B. Bronson, long private secretary to Clarence King, pays a tribute to the great engineer in the July *Century*. From it the following abstract has been made.

King's keen sense of humor was ever kindly; and his shrewd, searching wit, while it spared no one, never descended to hurtful sarcasm. He had tenderness, charity, and the broadest of sympathies, yet at bottom the heart of an untamed Viking, happiest when battling with elemental nature and her creatures in their wildest moods. With a learning so comprehensive and profound that he stood among the foremost savants of his generation, the hours dearest to him were those spent in absolute or semi-savagery, listening to the droning songs of squaws about old Winnemucca's lodge-fire; idly dreaming about a Paiute village, watching its primitive tasks and games; garlanded in a merry Kalakauan fête or breasting the breakers on a Hawaiian beach, himself as daring and swift in the water as the lithest or sturdiest islander of them all; vying with the best *vaqueros* of Visalia in bronco-riding contests; wandering through the corridors of the San Luis Obispo Mission with a bent Franciscan, absorbed in tales of Junipero Serra's heroism and sacrifices, and mentally reconstructing the stirring scenes of the ecclesiastical conquest of California; trailing grizzlies into their Sierran lairs and there fighting and killing them; scaling untrod mountain-peaks; listening to the croonings of a turbaned black grandmother, hungry for some hint of voodoo mysteries—such were the experiences he best loved. With never more than an indifferently lined pocket, his was ever the generosity, and often the magnificence, of a prince. With an artist's adoration of color, a musician's love of harmonies, and a poet's worship of the beautiful, the exactions of his profession as geologist held him so fast that he was left little leisure for the exercise of talents and genius that might easily have placed him among the most brilliant devotees of the arts.

His father was James Rivers King, son of Samuel Vernon King, one of the first commercial adventurers in the China trade; his mother, Florence Little King, a woman of rare intellectuality. Early in his youth he showed such fondness for nature that his mother determined to direct him into the paths of science, soon choosing geology as his specialty. Prepared in the endowed High School of Hartford, in 1859, when seventeen, he entered the Sheffield Scientific School of Yale, where he was a pupil of the great Dana. The winter after his graduation, he spent studying glaciology under Louis Agassiz. Preparations for his scientific work finished, the spring of 1863 found King and his classmate Gardiner, with a party of pioneers, plodding the old Overland Trail from St. Joseph to California. Stopping in Virginia City to see the famous Comstock Lode, the burning of their lodging-house destroyed all they owned, but did not impair their pluck. Working as laborers in a quartz mill, in a few weeks they earned enough money to enable them to finish their journey. On the boat from Sacramento to San Francisco, they met Professor William H. Brewer, then assistant to Professor Whitney, the chief of the Geological Survey of California, with whom a little later King won his degree as mountaineer by a successful ascent of Lassen's Peak. For three years the two friends remained with the California survey, King as assistant geologist, Gardiner as assistant topographer.

At a large dinner at the Pacific-Union Club in San Francisco as late as 1891, attended by a score of the leading business men of the city, I well remember a remarkable scene in which all joined in acclaiming and toasting Clarence King as the savior of the reputation of California. "But for King," said one bank president, "the free flow of capital for developing our mineral resources would have been set back twenty years." The incident referred to was the famous diamond swindle of 1872.

Great as were the opportunities for his brilliant talents on the California survey, Kings' audacious ambition conceived nothing less than a transcontinental geological and topographical survey. In 1866, therefore, he resigned and returned East to undertake, single-handed, the task of winning approval and adequate appropriations from the President and Congress. The Fortieth Parallel Survey, begun in 1867, was finished in 1878.

The work finished, King planned a rest, surely much needed after twenty years of unremitting toil. But it was not yet to be. In 1879, several independent surveys were consolidated into one bureau as the United States Geological Survey, of which King reluctantly accepted the directorship. This post he held until the new bureau was effectively organized, when, two years later, he resigned.

The three years next following he spent abroad, studying the geology of Switzerland and Great Britain; reveling in color and ryhthm with Ruskin; discussing physics with Sir William Thomson (later Lord Kelvin); comparing mountaineering notes with his great compeer, Tyndall; dipping deep into the secrets of crystalline rock structure as revealed by Zirkel's microscope; chaffing bar-maids with Bret Harte; seeing all sides of English and Continental life; collecting art-treasures; buying Fortunys, laces, embroideries, old furniture, and a barber's basin, the famous 'Helmet of Mambrino'.

Returning home at the end of 1884, King's later years were spent in the care of his mining and cattle-ranch interests and in pursuit of his profession as a mining engineer, largely in Cuba, Mexico, and the Klondike. Many were the disappointments and sad the trials of his later years, unhappily; but the harder the blows, the bolder he faced them; the darker his horizon, the brighter he smiled.

At the very end, on his death-bed that sad Christmas day of 1901, his last recorded words were the expression of a witticism as gay and brilliant as any he ever flashed across a dinner-table. His doctor had remarked that perhaps the drug *heroin*, recently administered, had gone to his head. "Very likely," King whispered. "Many a heroine has gone to a better head than mine is now."

Economics of Secondary Enrichment—I

BY A. M. FINLAYSON

SAN FRANCISCO

Introductory It may be taken as a truism that the process of formation of an ore deposit embraces not only its primary deposition, but the whole sequence of later events through which it has passed up to the advent of man. Only on such an understanding do the vital processes of secondary alteration receive adequate notice in the study of the natural history of ore deposits. This is the more essential in view of the great importance to man of secondary and superficial processes in the alteration and rearrangement of ores.

The principles of secondary enrichment were established ten years ago by S. F. Emmons, W. H. Weed, and C. R. Van Hise. Little has since been added to our knowledge of these principles, except in respect of chemical reactions. Detailed observations, however, have since multiplied enormously and given data for deducing generalizations of practical value. The recognition, at the present day, of the great part played by meteoric waters in concentrating many ores, is an eloquent testimony to the spirit, rather than to the letter, of Van Hise's work. At the same time, it is a matter for surprise that so little practical use has been made of the work of the American geologists, and that the application of the principles involved has made comparatively little headway with a large portion of the mining profession, as was remarked many years ago by H. C. Hoover, in discussing oxidation at Kalgoorlie.[1]

The result is that many of the data now available have been collected from the geological 'obituary notices' of the important mining districts.

Economic Effects of Secondary Enrichment. These are twofold. In the first place, lean ores that might otherwise be worthless are concentrated into valuable products; and secondly, the alteration of ores is often of great metallurgical import, as seen in the formation of lead-carbonate ores, oxidized copper ores, and free-gold ores. In some cases, the primary deposit has been completely disguised by secondary processes, notably at Mount Morgan, Leadville, Butte, and Bingham. Further enrichment often involves as its correlative a zone of impoverishment, as in the case of the leached gossan overlying the enriched sulphides of copper. The great industrial significance of secondary alteration clearly demands an effort to grasp the criteria by which these effects can be foretold with reasonable accuracy.

It is advisable for the present to confine attention to the metallic ores, though it should be noted, in passing, that among non-metallic deposits, many of the important phosphates are the result of secondary concentration by meteoric waters, with removal of valueless gangue. Such are the leached guanos of the West Indies, the nodular phosphates of Doullens, the phosphatic crystalline limestones of Barbuda and Aruba (West Indies), and the white bedded phosphates of Perry county, Tennessee.

Alteration of Metallic Ores As F. Kerosch has pointed out,[2] metallic ore deposits are divisible into two general classes. In those of the first class, the superficial chemical changes, owing to the refractory nature of the ores, proceed more slowly than the physical processes of erosion, with the result that no secondary alteration takes place, the primary ore outcropping at the surface. Under this head come ores of tin, tungsten, chromium, platinum, aluminum, as corundum, manganese, and iron, as oxides. These same principles, however, which preclude superficial alteration result in the formation of valuable placers, as in the case of tin, platinum, and gems. Thus the formation of placers is a true enrichment accompanying processes of erosion. Primary deposits of these metals, moreover, are liable to relative enrichment near the surface, whereby, with the removal of gangue, valuable deposits may result. A notable example of this is at Mount Bischoff, Tasmania, where the gossan of the tin stockwork has lost much of the decomposed gangue by weathering in place. Local subsidence has taken place, producing a pseudo-stratified structure. To this fact are due the famous 'brown face' and 'white face', carrying layers of sand that in places contain as much as 10 or 15% cassiterite. A similar relative enrichment has been observed on a small scale in the gossans of Cornish lodes.

In deposits of the second class, the chemical processes normally outstrip the physical processes of denudation, and there results a zone of oxidation, succeeded by a zone of cementation beneath the ground-water level. This is illustrated by the ores of iron (carbonate), manganese (carbonate or silicate), lead, zinc, nickel, cobalt, mercury, silver, gold, and copper. Whether alteration and enrichment take place in such cases depends, however, on the relative activity of erosion. Thus, in recently glaciated areas, like Canada and Scandinavia, and in districts of active stream-erosion, the oxidation zone, and often the succeeding cementation zone, may be shorn off, and the primary ore will then appear at the surface, as in the other class. In the case of gold also, where denudation is active, a large proportion of the valuable ore will be found in the alluvium.

It is evident then that the character of the ore on the one hand, and the relation between erosion and oxidation on the other hand, determine whether an ore shall be enriched in place, or by transport.

Classification of Secondary Processes. Secondary alteration and enrichment embraces several distinct, though related, processes, for which the following scheme of classification is proposed:

1. Concentration by erosion and sedimentation.
   - (a) Sedimentary or bog ores: Iron, manganese.
   - (b) Placers: Gold, tin, platinum, gems.
2. Concentration from a disseminated condition in rocks: Nickel silicate ores, manganese, some lead and zinc ores.
3. Oxidation.

[1] *Trans. Amer. Inst. Min. Eng.*, Vol. XXVIII, 1898, p. 758.

[2] *Zeitschrift für Prakt. Geol.*, Vol. XV, 1907, p. 129.

(a) Gossan enrichment: Many hematite and limonite ores, gold, silver (haloid ores), oxidized copper ores, etc.

(b) Residual deposits (with relative enrichment): Tin, manganese, iron, aluminium (bauxite).

4. Cementation and sulphide-enrichment: Copper, silver, gold.

The Water-Zone. The simplest conception to serve as a basis in interpreting secondary alteration is that of the water-zone, as defined by T. A. Rickard.[3]

The upper limit of the water-zone is the ground-water level, a level which is dependent on the local factors of climate and topography, and the physical and chemical nature of the rocks. The ground-water level marks—in principle, rather than in practice—the lower limit of the zone of oxidation. The lower level of the water-zone, or basement-level, is the level of maximum water-inflow in freshly opened mine-workings. Beneath this point, mines become gradually dry, until at depths of 2000 ft. or more, water ceases to circulate. Fissures and fractures, and subsequently shafts and adits, depress this basement-level, so that it sends projecting tongues down into the dry 'tight' region, as has been figured by Rickard. In general, the depth of the water-zone, as existing prior to mining operations, determines the depth of secondary alteration. Thus ore-shoots of secondary origin, or 'vadose' shoots, run horizontally in the longitudinal section of the vein, and, like the water-zone itself, send down tongues or teeth of altered ore like wedges into the primary ore beneath. Beneath the point of maximum water-inflow, the mine is in general working on primary ore. The depth at which this occurs is dependent, like the ground-water level above, on climate, on the character of the country-rock, on the occurrence of fissures and faults, and on other factors. Thus, in the Lake Superior region the basement-level varies between 600 and 900 ft., at Butte—a highly fissured area—it is nearly 2000 ft., at Cripple Creek it is 500 ft., at Rossland, 300 to 350 ft., and at Kalgoorlie, about 600 ft. The depth of oxidation is determined in the first place by the depth of the water-table, but owing to disturbing causes, the two are seldom coincident. In the first place, oxidation frequently extends below the water-level, as at Kalgoorlie and at Waihi. At Umkondo, in the Victoria district of Rhodesia, cupriferous shale contains malachite and azurite to a depth of 600 ft., while the ground-water level is at 100 ft. In the second place, the ground-water level is often much deeper than the base of the oxidized zone. This is the case in rugged mountainous districts with abundant rainfall and vigorous erosion. Thus in the Silverton district of Colorado, oxidized ores were shallow and of minor importance, while the ground-water level is from 50 to 200 ft. deep. It also results in arid regions, such as the Great Basin of western North America, which formerly enjoyed a humid climate. The climatic change to aridity is accompanied by a depression of the ground-water level, which then outstrips oxidation. Thus, in Sonora, Mexico, where the average rainfall is only 11 inches per annum, rich silicate ores occur to a depth of from 200 to 400 ft., while the ground-water level is considerably deeper. At Ely, in Nevada, the oxidized zone is from 100 to 150 ft. deep, and the water-table is at 335 feet.

[3]'Water in Veins—A Theory', *Eng. & Min. Journ.*, March 14, 1903; 'Waters, Meteoric and Magmatic', *Min. & Sci. Press*, June 27, 1908.

ENRICHMENT OF TYPICAL ORES

Iron. The bulk of the iron ores mined today owe their value either to oxidation in the presence of circulating meteoric waters or to processes of denudation and sedimentation. Examples of the former are the ores of Lake Superior, which supply 80% of the United States output, and nearly three-fourths of the world's iron, and the Cleveland and Cumberland hematites of England. Important sedimentary ores are the Clinton ores in the United States, and the black-band ores of Scotland and South Wales. Most of the western European deposits are the result of superficial processes. Carbonate ores, such as are abundant in the United States, are of little value at the present day, though they are to be reckoned as a future source of supply. The Bilbao deposits owe their great value to the oxidation of spathic replacement deposits, and, with the mining of the unaltered carbonates of late years, the end of this supply appears to be in sight. Primary deep-seated ores, such as the titaniferous magnetites, have not yet been turned to account. The magnetites of middle Sweden, and the magnetites of Swedish Lapland, on the other hand, do not owe their importance to superficial processes, at least in late epochs. The specular iron ores of Elba, which have been generally regarded as allied to contact deposits, are considered by De Launay[4] to be due to the oxidation of pyritic ores by circulating waters energized by later igneous intrusions following fracturing.

If this be the case, it is a striking instance of secondary oxidation by an unusual combination of agencies.

Manganese. The principal sources of manganese ore are conspicuous examples of secondary concentration, sometimes by normal weathering processes with the concentration of residual ore, and sometimes by sedimentation, with the formation of lake or bog ores. Notable instances of the former process are the great deposits of maganese ore in India, those of the Bukowina in Austria, Minas Geraes, Georgia, Virginia, and the Batesville region of Arkansas. The ores of Kutais in the Caucasus, and of Nikopol on the Dneiper are Tertiary bog ores formed from the erosion of manganiferous rocks.[5]

Aluminium. The bauxites of Pûy de Dome and Antrim, the Westerwald, the Vogelsberg, and Silver City (New Mexico) are due to the weathering and decomposition of basaltic rocks by atmospheric waters charged with suitable solvents. Many laterites, such as those of India, and of west and southwest Africa, have had a similar origin. The formation of bauxites and laterites is a phenomenon of secondary altera-

[4]L. De Launay, 'La Metallogenie de l'Italie', Congres Geol. Internat., Sess. 10, Mexico, 1906, Vol. II, p. 664.

[5]J. H. L. Vogt, *Zeitschrift für Prakt. Geol.* Vol. XIV., 1906, p. 217.

tion dependent on special climatic conditions.

Mercury. Secondary ores form a small part of the economic geology of mercury deposits, which in practically every case owe their value to primary cinnabar. Oxidation above the ground-water level results in the formation of native mercury and calomel, and some oxychlorides of mercury. These last have been a remarkable feature of the Terlingua quicksilver deposits, but in general oxidation products are of minor importance. The formation of such oxychlorides is probably, like that of silver chlorides, a result of the salinity of the ground-water in arid regions.

Nickel and Cobalt. Secondary alteration is a variable factor with ores of these metals. The nickeliferous pyrrhotites, such as those of Sudbury, have undergone no superficial enrichment. This is indeed the case with the majority of magmatic segregations or similar deposits of deep zones, owing partly to their refractory nature, and partly to their massive unfissured structure. On the other hand, the nickel-silicate ores of New Caledonia and elsewhere owe their value entirely to concentration from a disseminated condition by circulating waters of meteoric origin. The ore first mined in New Caledonia carried from 5 to 10% nickel; in 1901, at greater depths, the average content was 4%. The cobalt ore (asbolite), of New Caledonia, associated with the nickel deposits, affords a striking example of concentration of residual ore by weathering.

In the case of nickel and cobalt veins, the chief effects of secondary alteration are the formation of bonanzas of native silver, and enrichment of nickel and cobalt in the gossan. At Cobalt the masses of silver found at and near the surface appear to be of secondary origin, but owing to recent glaciation, the gossan has been removed from the upper parts of these veins. At Silver Islet, in Lake Superior, similar bonanzas of native silver were found, and at Annaberg, secondary silver chlorides with native silver contributed largely to the wealth of the mines. In the famous veins of Schneeberg, oxidation in places reached a depth of 550 ft. while the maximum depth of mining was not more than 1500 ft. In the upper parts of these veins, erythrite and asbolite were abundant and furnished the supply for the cobalt industry when it began in the 15th century. Since the characteristic sulphides of nickel and cobalt are end-products, they alter directly to oxidation-products, and there is thus no sulphide-enrichment beneath the zone of oxidation. Further, the gossan enrichment of these ores is the result of aggregation of the ore rather than of an actual increase of the metal in the mineral formed, as in copper ores. Thus, smaltite and cobaltite carry respectively 28.2 and 35.5% cobalt, while pure erythrite carries no more than 37.5%, and asbolite considerably less.

Lead and Zinc. In the case of ores of these metals, the important phases of secondary alteration are three, namely, the formation of cerussite, of calamine, and of secondary silver. The first two processes owe their economic significance to the fact that the enrichment is not a mere increase of metal but an aggregation of ore into comparatively pure masses, not to the secondary ore a more amenable to smelting.

The oxidation of lead ores was well shown at Leadville where the sand carbonate and the hard carbonate, accompanied by from 20 to 70 oz. silver per ton, were of great extent and value. Masses of similar ore, often extending to considerable depths, are a feature of the Sierra Mojada and Santa Eulalia mines, in Mexico. In these districts and in many others the chief factors determining the alteration have been the soluble nature of the limestone country rock, and the comparatively arid climate with slow erosion, which resulted in deep oxidation.

Calamine ores, formed by the removal of blende from the upper portions of veins, and re-deposition of the ore with more or less replacement of limestone or similar rocks, embrace some most valuable zinc deposits, such as those of Iserlohn in Prussia, Raibl in Carinthia, Upper Silesia, Spain, and many of the Belgian and Westphalian deposits. At Aschen, secondary calamine extends to a depth of 300 ft., where it gives place to blende. As a rule, calamine deposits show a preference for dolomite, owing to the greater porosity of that rock. As a result of the ready solubility of zinc ore, the upper portions of lead-zinc veins show an impoverishment of blende, accompanied by a relative enrichment of galena, while in the unaltered portions of the veins, blende may be the predominating ore.

Secondary silver ores have been a striking feature of most great silver-lead districts. Thus bonanzas of haloid ores are characteristic of desert regions, and were a remarkable feature at Broken Hill, where the gossan was deep, and at Santa Eulalia. Rich complex sulphides, formed in the zone of cementation were equally important at Neihart, Montana, and at Aspen, Colorado. In the Smuggler and Mollie Gibson mines of the latter district, rich polybasite ores with native silver occurred to depths of from 500 to 900 ft., in connection with cross-faults, and these secondary shoots were the main source of wealth of the two mines mentioned.

The secondary enrichment of argentiferous galena has a bearing on the loss of silver in the wet concentration of lead ore. Unaltered galena shows generally, under the microscope, no recognizable silver mineral, the silver being probably in a state of combination with the sulphide. Ore, on the other hand, that has been altered or enriched in its silver content, shows abundant fine threads of native silver following the cleavage-planes of the mineral. The occurrence of such ore may account for the notable loss of silver during dressing, much of the silver, freed by crushing, going off in the finest slime. The problem merits further examination at mines where highly argentiferous galena is worked and dressed.

Silver. The silver supplies of the world are obtained from silver-cobalt ores, silver-lead ores, and silver-gold ores. The alteration of these types is considered under the head of the respective associated metals. In general, native silver and haloid ores occur in the zone of oxidation, and complex silver sulphides in the zone of cementation beneath. Secondary silver ores have furnished some of the biggest

bonanzas in the history of metal mining: they are most characteristic of arid regions, where oxidation extends to a considerable depth, as at Broken Hill, and in the mines of Chile, Mexico, and the Great Basin. The abundance and value of haloid ores of silver in arid climates is a feature of great economic importance, and emphasizes the part played by climate in secondary alteration. It has been attributed by R. A. F. Penrose[6] to the salinity of the ground-water in such regions, and Charles R. Keyes[7] has referred cerargyritic ores to the presence of salt carried by wind-blown dust in these districts.

Gold. It is significant that practically all the world's great gold mines at the present day owe none of their value to enriched ore, but have depended upon primary ore persistent in depth. Mines and districts that thrived on secondary bonanzas have been short-lived, and have been scenes of disastrous booming and speculation, so that the secondary alteration of gold ores has often done more harm than good to mining. In the oxidized zone, the gold is freed from association with refractory sulphides and frequently becomes coarser by accretion. While these processes make extraction easier, they have also been the cause of failure, small concerns having been unable to treat the ore or save the gold from the deeper unaltered ore by means of unsuitable plant, only fitted for the outcrop ore. A notable effect of secondary alteration has been to raise the tenor of the bullion in the oxidized zone, as well as in the alluvium, by solution and removal of silver. Thus, at Mathinna, Tasmania, the alluvial gold has a fineness of 953.5, the vein-gold to the 360-ft. level is 900 to 955 fine, and at 1000 ft., 850 to 950. At Waihi, the gold of the primary ore is 645 fine, while Coromandel gold on the same field, which has been largely enriched, has a fineness of 750 to 800 per thousand.

Kolar, the Transvaal, and Kalgoorlie are three instances of localities where all the mines owe their success to unaltered ore persistent to a great depth. Secondary alteration has played only a small part in these cases, except perhaps at Kalgoorlie, where the occurrence of rich patches of oxidized ore, passing down into lean ore, led to the collapse of several concerns in the early days of the district.[8]

The great geological antiquity of the lodes, the subsequent metamorphism of the rocks that has rendered them highly resistent to weathering agencies, the dense quartz gangue, and the 'tight' unfissured structure of the country, are the chief factors hindering superficial alteration in these three districts.

Another great group of goldfields is the granodiorite group, with which are associated the chief alluvial districts. The deposits occur along the older mountain chains of the Urals, western North America, eastern Australia, and the south island of New Zealand. They have been subjected to prolonged and vigorous erosion in temperate or cold climates, with the result that denudation has proceeded faster than the chemical processes, and a large portion of the valuable content has been removed, and concentrated in placer deposits. The outcrop ore of the lodes is practically unaltered, and the ground-water level, though shallow, is commonly deeper than the range of oxidation. In most of these districts the economic value of the lodes depends upon the unaltered ore. If this extend deeply, as at Bendigo, a long-lived industry is assured. Elsewhere the lodes carry rich patches near the surface, succeeded below by lean ore occupying the roots of highly denuded veins, as in Otago, New Zealand. In some deserted parts of Otago veins have been stoped from the surface to the ground-water level, a depth of from 20 to 40 ft., and rich patches mined, while the primary ore beneath has been left almost untouched. Whether alteration plays any important part in these grano-diorite regions is, however, largely dependent on climate and topography, that is, on the rate of erosion. Thus the ores of Rossland and of the Alaska Treadwell are practically unaltered at the surface. On the other hand, at Charters Towers, where the climate is arid and the surface flat, oxidation, with enrichment, has occurred to depths of 200 and 300 ft., and Mount Morgan, under similar climatic conditions, was once the world's greatest gold mine, owing to the effects of deep oxidation (180 to 300 ft.) in freeing the gold from the pyritic gold-copper ore of the lower zones. There also, the zone of cellular oxidized gold ores was succeeded by a prominent zone of secondary gold and sulphide ore.

A distinct type of deposit embraces the gold-silver veins of Tertiary age, associated with andesites or similar volcanic rocks. These lend themselves readily to alteration and enrichment, owing to the thermal alteration and ready decomposition of the enclosing rock, and to the frequent occurrence of the veins in areas of disturbance and fissuring, whereby ground-waters may circulate to great depth. In these districts the influence of climate is often strikingly displayed. The primary ore is commonly high in silver, and oxidation processes raise the tenor of the bullion, and frequently form silver bonanzas.

An instructive comparison is afforded between the Thames and Waihi districts of New Zealand. At the Thames, bonanzas occurred to a depth of about 500 ft. These were intimately related to the occurrence of cross-faults, and were probably largely of secondary origin. In depth, the veins become lean, so that prospects are not bright. At Waihi, on the other hand, though oxidation extends to a depth of 500 ft. beneath the outcrop, there is little or no enrichment, and the gold in the lodes is almost wholly original. The Mexican mines show effects of enrichment closely dependent on climatic conditions. Thus in the El Oro district, the ground-water level is deep, and the San Rafael lode has an extensive zone of oxidation, in which the proportion of gold to silver in the ore has been raised from 1:15 to 1:6. At Pachuca the oxidized zone carried free gold, and hornsilver, while the zone of sulphide enrichment beneath contained corresponding bonanzas of silver sulphides. In Nevada, similar conditions obtain. Goldfield owes practically all its importance to rich irregular ore-shoots in the oxidized zone. The ground-water level

[6] *Journal of Geology*, Vol. II, p. 314.

[7] *Economic Geology*, Vol. II, 1907, p. 774.

[8] H. C. Hoover, *Trans. Amer. Inst. Min. Eng.*, Vol. XXVIII, 1898, p. 758.

here 150 to 200 ft. deep is shallow for an areal region. At Tonopah oxidation reached a maximum depth on the Mizpah vein of 700 ft. and the oxidation zone has been characterized by silver chlorides together with native silver and pyrargyrite. Oxide and sulphide ores are more or less intermixed, the two zones not being sharply separated. The ground water level is extremely irregular owing to complex fissuring, one shaft being dry to a depth of 1100 ft. The Colorado goldfields of this type are mostly in regions of bold topography and heavy rainfall with consequently more rapid erosion and enrichment is of minor importance. At Cripple Creek there is no evidence of enrichment either in the oxidized ore, which extends to a depth of 200 to 400 ft., or in the telluride ore beneath, nor is there any enrichment at the Camp Bird, which is at a high altitude in a region subject to snowslides. A question of much practical importance is the subject of telluride enrichment of gold ores, corresponding to sulphide enrichment. The question has been raised by Malcolm Maclaren,* but no very definite evidence has so far been forthcoming.

ELECTROLYTIC COPPER REFINERY

The method of designing an electrolytic copper refinery may be illustrated by the following figures for a 12-ton plant. According to European practice one ampere-hour of current will deposit 1.183 grams of copper. One ounce equals 28.35 grams, and in a 12-ton plant the deposit of copper should be:

$$\frac{12 \times 2000 \text{ lb.}}{24 \text{ hours}} = 1000 \text{ lb. per hour.}$$

hence $\frac{1000 \times 16 \text{ oz.} \times 28.35 \text{ gm.}}{1.183} = 383{,}432$ ampere hours.

If the whole work has to be accomplished in one plant and plans for 90 vats in three series of 30 each be adopted, then the generator would have to furnish:

$$\frac{383{,}432}{90} = 4260 \text{ amperes.}$$

The voltage required per vat should not, in a well designed plant, exceed 0.6; but allowing for impurity of the anodes and other local conditions 0.8 will be a safe maximum. For 90 vats, then, $90 \times 0.8 = 72$ volts, will be needed, and $72 \times 4260 = 306{,}720$ watts = 411 horse-power to deposit 12 tons per 24 hours, or 34.25 hp. per ton as a maximum figure. But, as noted above, a voltage of 0.6 per vat should be ample under perfect conditions, and if this figure be adopted $90 \times 0.6 = 54$ volts will be needed and $54 \times 4260 = 230{,}040$ watts = 308.3 hp. to deposit 12 tons or 25.7 hp. per ton of copper deposited.

Suppose a current density of 12 amperes per square foot anode and cathode surface be figured, and for a generator maximum figures, 411 hp., be taken, with 10% added for loss in efficiency, the total will then be 452 hp. which, divided among three generators of 151 hp., calls for 150 hp. each. Assuming 12 amperes current density to be correct, $\frac{4260}{12} = 355$ sq. ft. anode surface will be needed in each vat. This may be taken as 360 sq. ft. in round numbers. Allowing a superficial area of 8 ft. per anode, 45 anodes $\frac{360}{8}$ will be needed in each vat. Figuring the size of the anodes to be 10 by 10 in. will just give 8 sq. ft. area for both sides. Anodes should be made about one inch thick and should have a lug cast on each with a hole suitable for a hook. The width of a vat depends upon how many anodes are placed in it and connected on each single positive conductor bar. Suppose three to be arranged on a bar and a 2 in. space be left between them with 3 in. between the anodes and the sides of the tank, then the width of the tank will be 58 in. Dividing the 45 anodes by 3 gives 15 as the number of rows of anodes. A space of 2 in. should be allowed between the electrodes, and as there should always be one anode between two cathodes it follows that there must be in this case 15 rows of anodes and 16 rows of cathodes. Fifteen rows of anodes, 1 inch thick equals 15 in., 16 rows of cathodes, $\frac{1}{8}$ in. thick equals 2 in., and 32 spaces of 2 in. equals 64 in. These added make the total length of a vat, 81 in. Allowing 10 in. space below the anodes will give a depth of 46 in. The size of the vat therefore should be 7 ft. long by 5 ft. wide by 3 ft. 10 in. deep.

At each series of vats the positive terminal of the generator is connected with two copper bars, well insulated, resting on the vat. Slightly elevated above these two bars are placed two negative copper bars, which at the end of the vat are bent and extended into the next vat as positive bars in line with the terminal bars in the first vat; and so on from vat to vat until the end of the series, where the last pair of bars is connected with the negative terminal of the generator. Iron cross bars from which the anodes are suspended rest on the positive conductor bars, and iron bars supporting the cathodes rest on the slightly elevated negative conductors. The vats are filled with the solution $H_2O + CuSO_4$, and it is important to have this solution circulate both rapidly and quietly in order not to disturb the mud collected. All the anodes and cathodes in a vat should be raised and lowered in a battery and transferred by help of a traveling crane or overhead crawl. The anodes may be cast in the copper converter plant in sizes as given above, transferred to the electrolytic refining plant, and placed in the vats. The cathodes should be of the purest commercial sheet-copper of the same sizes as the anodes. The electrolytic process transfers all the copper in the anodes, less the impurities, to the cathodes, and the copper accumulated on the cathodes varies but a small fraction from 100% pure. The plant should, by preference, be housed in a steel building on stone or on a concrete foundation.

Exports of iron and steel manufactures in the past fifteen years exceeded imports thereof by $1,400,000,000, while in the fifteen years immediately preceding the imports exceeded exports by $300,000,000. Meantime the United States has become by far the world's largest producer of pig iron, domestic production having advanced from 4,000,000 tons in 1885 to 25,750,000 in 1909, and exceeding in that year the combined product of her principal rivals, Great Britain and Germany. This large excess of exports represents a development in the domestic industry brought about in comparatively recent years.

*'Gold,' London, 1908, p. 114.

Boise Basin, Idaho

By W. A. Scott

The name 'Boise Basin' is applied to an area of nearly 300 square miles in Boise county, Idaho, which is drained by Moore, Elk, Grimes, Wolf, and Granite creeks, the waters of which flow southerly into Boise river. The basin, as outlined by the contour of this drainage system, is nearly fan-shaped. Idaho City is situated at the confluence of Elk and Moore creeks. Centerville and Pioneerville are on Grimes. Placerville is on Wolf, and Quartzburg is in Granite creek canyon. Idaho City is close to the southeastern rim of the basin, Quartzburg is at the western extremity, with Centerville in the central part.

Placer Mine on Grimes Creek, Boise Basin, Idaho.

From 1863 to 1875 there was intense activity in placer mining on these creeks, and the production of gold was such as to give Boise Basin a high place in the annals of this kind of mining. Those years of bonanza production have been succeeded by thirty years of steady uneventful work on the same creeks and their adjacent banks, and while there has been, undoubtedly, a steady decline in the annual clean-up of placer gold, the production today is relatively good. Much of the tailing that resulted from hydraulic work has been re-worked by dredging, and some of the dredging operations now in progress are in virgin ground. The period of hydraulic work with giants is limited to about four months, as the water supply usually runs short in July. This is especially true as to Moore, Elk, and Wolf creeks, but the season on Grimes creek is longer.

The Boston & Idaho Gold Dredging Co., for which W. H. Estabrook is manager, is operating one dredge of the Risdon type, having 5-cu. ft. buckets, open-connected, handling about 2000 yd. per 24 hours, digging to a depth of 20 to 30 ft. This is being operated on Moore creek, seven miles down stream from Idaho City. The same company is having a new dredge built on Elk creek, half a mile up stream from Idaho City, which will have a chain of 13-cu. ft. buckets, close-connected, giving as great capacity as that of any dredge in the country. It is being built by the Yuba Construction Co. The Elk creek material to be handled by this dredge was sluiced in early days. This company owns the electric power-plant, situated on Payette river, below Horseshoe Bend, current from which is transmitted to all places in Boise Basin where power is needed for dredges, mills, and hoists.

The White Quartz Mining Co., made up of Ohio and Pennsylvania men chiefly, purchased the H. L. Woodburn placer property last April at $125,000, and in 1909 purchased the Mann & Hanson holdings. These purchases give the new company all of the Gold Hill placer grounds, including the former Plowman placers. It comprises the area between Bear run and Lincoln gulch, a part of it facing Elk creek; as well as all water rights and ditches controlled by the former owners. There are said to be 100 miles of ditches by which water is taken from Moore and Elk creeks. The Mann & Hanson ditch, which carries 500 in. of water, is to be enlarged to carry a much greater volume; the Plowman ditch is also to be made larger. The workable gravel of the Gold Hill area has a depth of 60 to 70 ft. At present four giants are being operated in two pits facing Elk creek. C. F. Herrick, by whom the purchases were made, is the company's manager.

The Centerville Mine & Milling Co. has an extensive area of placer ground on Grimes creek, both

above and Grow Centerville. It consists of placer tailing in the bed of the stream and both worked and unworked ground on the adjacent banks and benches. It has been demonstrated that there is here a considerable yardage of virgin ground covered by tailing. The company has hydraulic giants at work on tailing and new ground in the stream and on the higher benches. The work on the creek is supplemented by a hydraulic elevator by which the material is raised from the bedrock to the sluiceway, a height of 17 ft. It has been known for several years that monazite in liberal quantity is disseminated throughout the placer ground of this creek, not only in the creek bed but the material of the banks and bluffs. It is found slightly concentrated close to the bedrock in the tailing deposited by giants and dredges. The company, under the management

of S. K. Atkinson, has erected a milling plant at Centerville for concentrating this hydraulic tailing and for separating the monazite from the magnetite, silica, and other minerals. By screening and table-concentration a product is obtained which is said to contain 25% monazite. This is first dried in a revolving dryer, then passed through a rotating magnetic machine of low intensity by which the magnetic iron particles are taken out, after which it passes through the field of a magnet of greater intensity by which particles of ilmenite and garnet are taken up; and finally the residue is passed through a still more powerful magnetic separator which takes up the monazite, leaving a non-magnetic residuum consisting of zircon and silica. The monazite concentrate thus obtained is said to be 90% pure, and carries 6% thorium, the extraction of the latter being the ultimate object of mining and milling the monazite bearing sand. The magnetite and zircon, however, are considered valuable by-products. The milling plant contains an elevator, revolving screens, 12 Wilfley and Card tables, a dryer, and five electro-magnetic machines, and has the capacity of 100 tons per day. Additional equipment to be provided is to consist of arrangements for conveying the material from the bedrock of the stream to the mill by hydraulics. The magnetic separators in use were designed by members of the company's staff. These monazite-bearing deposits resulted from the disintegration of the granitic bedrocks, which contain some pegmatite, the monazite being closely associated with the latter. It is estimated that the virgin ground contains from 0.01 to 0.1% monazite, and that in the tailing the latter is more concentrated and runs from 0.1 to 1%. The new ground, therefore, is being worked for placer gold by the ordinary methods, and the plan is to concentrate the tailing, both old and new, for the recovery of monazite.

The monazite production of the United States for the year 1908 was 422,646 lb., worth $50,718 at 12c. per pound, and the imported article, which pays a high duty, for that year amounted in value to $173,239. The domestic product heretofore has been mined in the Carolinas, the foreign product in Brazil, the importers being Germans mostly. Thorium nitrate, obtained from monazite, is largely used in the manufacture of incandescent gas mantles. The Centerville M. & M. Co. has expended $150,000 thus far in equipping the property.

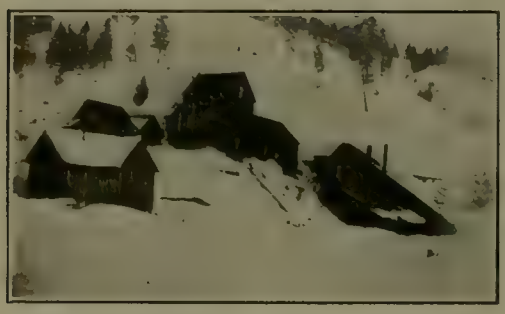
The Moline Mining Co., for which E. F. Blaine is manager, has a 5-cu. ft. Risdon dredge at work on Fall creek, close to its confluence with Granite creek. The latter empties into Wolf creek below Placerville. This dredge, which has a record of successful operation, is performing its fifth season's work and is in direct charge of Bird Will, formerly of Oroville. In this period about 80 acres have been dredged on Granite and Fall creeks. After passing through a deposit of tailing the fore part of the season the boat is now pushing up Fall creek in virgin ground, which runs from 35 to 40 ft. deep. The dredge handles about 1200 yd. per day and operates by steam-power, using wood as fuel.

The Boise Basin Hydraulic & Power Co., concerned in which are Albert Burch, of San Francisco; M. A. Folsom, of Spokane; E. S. Robinson, of Placerville; and others are interested, has 19 placer claims lying between Wolf and Ophir creeks, east of Placerville. The company has hydraulic giants in operation in two or three pits, and usually operates from the latter part of March to July 15. Mike Leary, his sons, and associates, have been hydraulic mining on Wolf creek, at Placerville, for forty years, and they are still operating profitably. They have other ground on Granite creek. A 14-mile ditch from Granite creek carries the necessary water to their gravel banks at Placerville.

The Columbia Mining Co. has locations covering a lode parallel to that of the Gold Hill and Iowa. Its vein is opened by a 250-ft. shaft on the west side of Granite creek, and by three adit levels on the oppo-

site side, all these openings being on the vein. A mill was built last year which is idle at present. It is equipped with a crusher, Chilean mill, plates, and tables, and the plan is to cyanide the concentrate. I. H. Friar, the manager, states that arrangements are being made to resume work. This property is known locally as the Last Chance.

The Golden Age mine, owned by Spokane and Portland people, is situated at Grimes Pass, six miles northeast of Pioneerville. There are two veins which are opened by an 1800-ft. cross-cut that gives a depth of 300 ft. Considerable driving has been done in ore on this level. A winze is to be sunk on the main vein from the cross-cut level. The vein varies in width from 1 to 12 ft., and is said to have an ore-body that averages 30 in. wide. The ore contains free gold and sulphide material. A 15-stamp mill, equipped with plates and tables, is operated by water-power, there being two Pelton wheels having the pressure of 110-ft. head of water from Grimes creek. E. R. Abernethy is superintendent and there is a force of 30 men on the property. The Golden Rod M. Co., owning the Mineral Hill property north



Pioneer Shaft, Gold Hill Mine, Quartzburg, Idaho.

of Placerville, has considerable development, which shows a series of small veins in altered granite and porphyry, the ore containing gold and silver in sulphide of iron, but with some free gold, and bismuth. The mill, which has a crusher and Chilean mills, is to have a tube-mill and filter-presses added, to adopt the all-slime process. A. C. Gallupe, who has charge, states that arrangements have been made to start work again.

Quartzburg is the home of the Gold Hill and Iowa mines, now consolidated under the ownership of the Gold Hill & Iowa Mines Co., for which E. E. Carter is manager and W. L. Bowron is superintendent. The two original mines were on a strong northeast vein, which stands almost vertically in a porphyry dike, cutting through a granite country. The ore occurs in shoots from 7 to 30 ft. wide, and 30 to 100 ft. long; within these shoots are chimneys and lenses. The vein boundaries are not in all places sharply defined. The gangue is largely porphyritic, but it contains a great many stringers of quartz. It carries gold in free state, and in association with stibnite, both crystallized and massive. It carries 2 to 3% iron and a still lower percentage of lead and zinc. The principal work is carried on through a 3-compartment shaft, which is now 500 ft. deep. The main workings are on and above the 400-ft. level; but driving is to begin from the 500-ft. station to get at the ore beneath the old workings. The mill which is in operation is equipped with 20 stamps, a Lane mill with amalgamating plates below it, six Bartlett tables, three vanners, and two Pachuca agitating tanks. A Richards pulsator classifier is in use between the plates and tables. The table and vanner concentrate, which is about 50 mesh, is elevated to the Pachuca tanks for agitation and cyanidation. The recovery on the plates is said to be 55% of the total saving. The mill, air-compressor, and double-drum hoist are electrically operated, this power costing the company $5.40 per horse-power per month.

The Idaho-Elkhorn Mining Co., managed by E. F. Fitzhugh, owns part of the old Elkhorn group and has a bond on the other part. This is an old mine which was active and productive from 1865 to 1870, having produced at that time half a million dollars. It is at the head of Elk creek, 12 miles northeast from Idaho City. There is a 1500-ft. cross-cut that strikes 250 ft. below the old workings. The formation is faulted, making a complex vein system. However, the lead has been found by driving from the old cross-cut, and drifting thereon is in progress. The ore in the old workings is a gold-bearing quartz, and the vein is in granite.

The Edna Mines Co. has a developed and producing mine close to the north fork of the Boise river, 22 miles northeast from Idaho City. While this property is outside of Boise Basin, all the travel and freight destined for the Edna is by way of Idaho City, which is 36 miles north of Boise. The principal vein of the Edna consists of a fissure in a granite formation, having a width of 7 to 14 ft. It is opened to a depth of 340 ft. by a 1400-ft. cross-cut, and by 1000 ft. of driving on the vein; also by a 3-compartment raise from that level to the surface whereby the stopes were opened. A 100-ft. winze was sunk on the vein from the main level. The ore runs 98% silica and carries chloride and sulphide of silver, accompanied by some gold. Charles R. Watson, manager for the company, states that the ore contains $10 in silver to $1 in gold. The iron in it amounts to less than 1%, and copper and lead about the same. The ore runs 22 oz. silver and $2 gold per ton. The new mill, now nearly finished, is expected to be in operation by July 1. It is equipped with a Blake crusher, 11 by 15 in.; 8 Nissen stamps, making two 4-stamp batteries, with mortars having 10-mesh screens. The stamp-crushing is to be in cyanide solution. The pulp will pass from the batteries to a double Dorr classifier, the slime from the latter to six 8-ft. Callow tanks. The overflow from the tanks goes to the mill sump; the dewatered slime passes to one of a series of Gordon tanks, making a continuous process. The Dorr sand is reduced to 150 mesh by an 8-ft. Hardinge conical mill, after which it passes by a launder to the Gordon agitating and aerating tanks, which are each 15 ft. high, 20 ft. diam. The slime solution in those tanks is drawn off to Moore filters having 5280 sq. ft. of filtering surface. The solution is passed to zinc boxes for precipitating the metals. According to 250 tests which were made, the cyanidation of these ores will require 3 lb. cyanide to the ton of ore.

Iron Ores of California

By E. C. Harder

*Iron ore deposits are abundant in different parts of California, yet until recently no ore had been mined. The only iron-ore furnace in the State is an experimental Heroult electric furnace installed in 1907 by the Noble Electric Steel Co. at Heroult on Pit river, Shasta county, and operated intermittently in 1907, 1908 and 1909. During 1909 a commercial furnace was erected. The ore used is mined in the vicinity of the plant. Besides the Noble furnace there are only four iron-ore furnaces in the Western States—the Minnequa coke furnaces at Pueblo, Colorado, consisting of six stacks; the Irondale charcoal furnace at Port Townsend, Washington, consisting of one stack; the Black Sand & Gold Recovery Co.'s electric furnace at Hood River, Oregon, and the Oswego charcoal furnace at Oswego, Oregon, consisting of one stack. The Oswego furnace has not been active since 1894 and the electric furnace at Hood River is only in an experimental stage. The Pueblo furnaces, however, have been operated regularly for many years, their ores being obtained largely from Wyoming, Colorado, and New Mexico. The furnace at Port Townsend has been active intermittently, its ores coming from Texada Island, British Columbia, and from Washington. No California ore has been used in any furnace outside of the State.

The principal iron-ore deposits of California are the Pit River or Redding deposits, Shasta county; the Gold Valley deposits, Sierra county; the Minaret deposits, Madera county; the Iron Mountain, Cave Canyon, Providence Mountain, and Newberry deposits, San Bernardino county; and the Eagle Mountain deposits, Riverside county. Of minor importance are the Patamocas or Beegum deposits, Tehama county; the Newtown and Indian Springs deposits, Nevada county; the Hotaling deposit, Placer county; the Detert deposit, Calaveras county; the Mount Raymond deposits, Madera county; the Perfumo Canyon deposit, San Luis Obispo county; and the Owl Holes, Kingston Range, Garlic Springs, and Iron Age deposits, San Bernardino county. Numerous other small deposits are known. The Minaret deposits, situated near the summit of the Sierra Nevada, are said to be the largest in California, and perhaps in the West. Of nearly equal size are the Eagle Mountain deposits, situated near the boundary of the Mohave and Colorado deserts; all the rest are much smaller. The only ores which have been worked with the intention of producing pig iron are the Hotaling deposit, operated some years ago unsuccessfully on account of the high cost of fuel, and the Pit River deposits, operated intermittently for the last few years to obtain ores for use in the Noble electric furnace. Practically, therefore, the iron ores of California are untouched.

The Perfumo Canyon iron-ore deposit is in San Luis Obispo county, about five miles south of west from San Luis Obispo, in the San Luis or Los Osos mountains. It consists of a nearly vertical bed of limonite interlayered with dark shale and sandstone of the Franciscan formation (Jurassic). The bed strikes in general a little north of west and is said to be traceable for more than a mile, but was followed by me through only about half of its extent. Its thickness varies from 8 to 12 ft. The ore is largely a dark brown or black glossy limonite finely banded and laminated parallel to the strike of the bed. Numerous fractures run through the bed, so that the ore breaks up into small variously shaped blocks with plane surfaces. This condition is characteristic of the bed throughout its extent. The following are analyses of the ore and the highly ferruginous shaly sandstone.

ANALYSES OF IRON ORE AND WALL ROCK FROM PERFUMO CANYON, CALIFORNIA

(Dickman & Mackenzie, analysts, Chicago)

		Iron, %	Phosphorus, %	Silica, %
1	Ore outcrop near creek, 11 ft. of ore	44.80	0.500	15.41
2	Ore outcrop 2000 ft. southeast of No. 1	47.60	0.530	11.20
3	Ore outcrop 3000 ft. northwest of No. 1	46.10	0.510	13.10
4	3 ft. of ferruginous shale underlying No. 1	16.30	....	..
5	Ferruginous shale, average	13.30	..	..
6	Ferruginous shale, selected	13.40	..	..

It seems clear that the iron ore of Perfumo Canyon is an original sedimentary deposit formed during an interval in the deposition of the inclosing sandstones and shales. It is probably of the nature of a bog deposit which has been consolidated during the compression and folding of the accompanying strata. On the assumption that the bed has a fairly regular thickness of 10 ft. there would be a great tonnage of low-grade ore left in the ground. For commercial purposes, however, it must be considered that the bed may vary in thickness beneath the surface, may pinch out altogether for long distances, or may grade into ferruginous standstones at slight depths. A depth greater than 100 ft. should not be assumed without exploration, and this would reduce the probable available quantity to a few hundred thousand tons of low-grade ore, which is a fairly safe commercial estimate.

Several small deposits of brown iron ore occur in Calaveras county as replacements in slate or schist. They are in the central part of the Mother Lode district, in the western foothills of the Sierra Nevada. There are three localities at which iron ores are known in Calaveras county, one and one-half miles northeast of Valley Springs, half a mile north of Esmeralda, and one mile north of Murphy. All the bodies are small and consist of low-grade ore, so that they are of little or no commercial importance.

The Hotaling iron-ore deposit is six miles north of Auburn and three and one-half miles northwest of Clipper Gap, Placer county. The workings, consisting of several trenches, pits, and shafts, are on a small wooded knoll extending southwestward from a higher ridge. One shaft has an engine house in connection. Ore was mined and smelted here some

*Abstract from Bull. 430-E, U. S. Geol. Survey.

years ago and considerable ore is still in the dumps. A band, perhaps several hundred feet wide, of fine-grained basic igneous rock, probably diabase, crosses the knoll in a northwest-southeast direction. Northeast of it, forming the higher ridge, is a mass of granodiorite; to the southwest, on the slope of the knoll, are sediments of the Calaveras formation (Carboniferous), here largely quartzite. The granodiorite is later than the diabase, and both are later than the Calaveras formation. The iron ores occur at the contact of the diabase and the quartzite and within both formations, though more generally in the diabase. The ore is magnetite, both fine grained and coarse grained, and with it are associated a large number of minerals, such as garnet (andradite), epidote, pyroxene (augite), amphibole (anthophyllite), calcite, pyrite, chalcopyrite, and quartz. The workings extend along the contact of the quartzite and diabase through a distance of 150 or 200 ft.,

Map of Portions of Southern California, Nevada and Arizona Showing Iron Ore Deposits

and the extent of the ore beyond this in either direction is problematic. Most of the ore is thoroughly intermixed with the metamorphic minerals and later vein minerals and is therefore of low grade. The orebody is small and as a whole of low grade.

The Iron Age iron-ore deposit is six miles east of Dale and a mile or two north of the boundary line between San Bernardino and Riverside counties, in a barren desert region. It is in the eastern part of a range of bare mountains extending east and west along the boundary line and connected by an area of low hills with the Pinto mountains to the southeast. The deposit may be reached from Dale by a direct trail through the mountains or by a circuitous wagon-road along the edge of the desert area to the north, a distance of ten or twelve miles. The Dale pumping station, about six miles north of Dale, is the nearest watering place, and there is no other spring or well within a radius of twenty miles. The mountain range in which the iron ores occur consists of intrusive dioritic, granitic, and syenitic rocks of varying texture. In the southern part of the Pinto mountains metamorphosed sediments are associated with these rocks, but elsewhere no sediments occur.

The Iron Age iron ores are largely hematite altered from magnetite, in the form of veins cutting intrusive granite and granite porphyry. Metamorphic minerals, chiefly garnet and epidote, are locally associated with the ore and rocks. The principal iron-ore veins occur over an area about half a mile square, the larger veins, on account of their resistant nature, forming the summit of a large hill. Several small veins occur in the area between the Iron Age deposit and Dale. The ores are very pure and of high grade, but the veins are not of sufficient extent to make the deposit especially attractive commercially. The iron-ore veins composing the Iron Age deposit undoubtedly originated from hot deep-seated solutions, being formed after the cooling and consolidation of the igneous rocks in which they occur.

CLASSIFICATION OF PETROLEUM AND NATURAL GAS FIELDS BASED ON STRUCTURE

By Frederick G. Clapp

*The main divisions of the classification proposed are as follows: (I) Anticlinal and synclinal structures: (*a*) strong anticlines standing alone, (*b*) well defined anticlines and synclines alternating, (*c*) monoclinal slopes with change in dip, (*d*) terrace structures, (*e*) broad geanticlinal folds. (II) Domes, or quaquaversal structures (Salines). (III) Sealed faults. (IV) Oil and gas sealed in by asphaltic deposits. (V) Contact of sedimentary and crystalline rocks. (VI) Joint stacks. As examples of subclass I (*a*), the fields on the Eureka-Volcano-Burning Springs anticline of West Virginia and certain California fields are given. In subclass I (*b*) are placed most of the fields related to anticlines and synclines in the Appalachian province, the Caddo field of Louisiana, the Coalinga and Los Angeles fields of California, and the Burma and other well known fields in other countries. The majority of the oil and gas pools of southeastern Ohio belong in division I (*c*), or in I (*d*), which is an exaggerated form of I (*c*). The best example known of subclass I (*e*) is stated to be the extensive field on the Cincinnati anticline in Ohio and Indiana. Class II includes the fields of the gulf coastal plain. Class III is exemplified by certain pools in the Lompoc field and perhaps other fields of southern California. Class IV is somewhat hypothetical so far as oil and gas accumulations of economic value are concerned, but it may be exemplified by the pitch lake of Trinidad. Class V is known to exist in the Province of Quebec and to some extent in northern New York, where natural gas is found in the arkose zone of the Potsdam sandstone resting on prominent knobs in the underlying crystalline rocks. Class VI was added after the discussion in accordance with a suggestion by M. R. Campbell. An example of it is a part, at least, of the Florence oilfield in Colorado.

*Proposed in a paper read before the Eng. Soc. Western Pennsylvania and the Wash. Geol. Society.

Mine-Rescue Work

Now that the Bureau of Mines is about to begin work, attention is being sharply directed toward mine accidents and their prevention. Incidentally mine-rescue work and first-aid training for miners seem likely to receive some of the attention they long have needed. In the United States the work so far done has been mainly in the coalfields. The anthracite coal companies have taken the lead in systematically training their men in first-aid work, while the U. S. Geological Survey, through the Technological Branch has done most important work in the study of explosions, and in mine rescue work. Because of a limitation in the act making appropriations for this work, attention has been concentrated on accidents in coal mines. Under the new law these studies can be expanded to cover metal mines as well. That there is room for such expansion is clear to everyone familiar with the subject. While figures covering accidents in metal mines are notoriously inaccurate, it is clear that in many districts they rival in number those in coal mines, despite the greater frequency in the latter of dangerous gases.

The mine-rescue work of the Geological Survey grew out of attempts to determine the causes of coal mine explosions. In order to get at the facts it was necessary that the engineers should make prompt investigation of each accident, and this in turn gave them active and honorable part in mine-rescue work. A general testing laboratory has been equipped at Pittsburg and branch rescue stations have been established at Urbana, Illinois, Seattle, Washington, and Knoxville, Tennessee. So important and successful has been the work done at these stations that Congress has now appropriated money which will allow the establishment of nine more, and the General Assembly of Illinois has provided for three others. The Colorado Fuel & Iron Co., the Pittsburg Coal Co., and other corporations have opened stations of their own.

The equipment and work of such stations has been discussed by R. Y. Williams, the mining engineer in charge at Urbana, Illinois, in connection with plans for the new Illinois stations. From his paper, presented to the Western Society of Engineers, May 4, the following notes are condensed.

"The station building should contain a gas-tight room, 40 ft. long by 20 ft. wide and 10 ft. high. (Fig. 1.) The interior of this room should be fitted to resemble a mine and to afford opportunity for the practising miner to do work similar to that required in the event of an actual disaster. In a number of stations already built in this country, it has been the practice to divide this room longitudinally and to construct an overcast on one side, the aim being to present a passageway about the room, the travel over which would represent the journey of a rescue party through the entries of a mine. This room should be furnished with mine props and a frame consisting of four pieces of 6 by 8-in. timbers joined together in the shape of a square and tied with two iron rods, in which props may be set and capped with wedges; also brattice cloth, stretchers, and a canvas dummy filled with sand and sawdust so as to weigh about 165 lb. In order that the men may gain confidence in working in the presence of gas, sulphur candles may be burned in this room to form a choke damp; charcoal may be fired in open salamanders yielding black damp; hydrogen disulphide may be generated producing stink damp; or ordinary dense smoke may be obtained by burning dampened excelsior. Adjoining the smoke room and separated from it by a glass partition, should be an observation room where visitors may sit and view the work of the miners. Here, too, the instructor may observe and record the performance of each member of the rescue squad. In this room there should be wall-cases in which the rescue apparatus may be hung

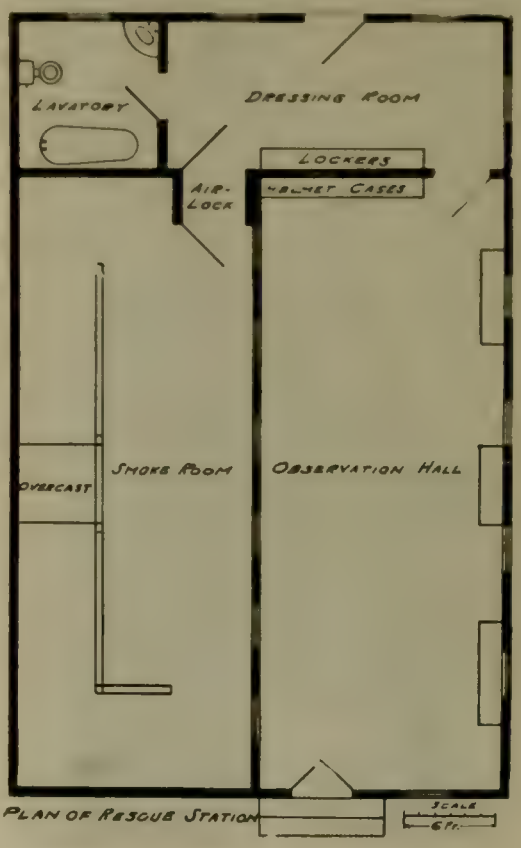


Fig. 1.

and protected from dust; there should be work benches to facilitate the cleaning of instruments and the charging of electric safety lamps; and a place to store the cases in which the apparatus is shipped. Back of the smoke room there should be a lavatory containing toilet, shower-baths, and lockers for the accommodation of the miners coming to the station for practice.

"The equipment of the station should include oxygen helmets, or other suitable breathing appliance furnishing a dependable supply of pure air, with the aid of which men may safely enter any kind of foul and most poisonous atmosphere in order to perform rescue work. Apparatus and supplies for recharging these machines, portable electric safety lamps with a convenient device for recharging, a supply of some standard make of oil-burning safety

lamps, and one or more resuscitating cases for use in reviving men overcome by the afterdamps of mine fires or explosions should be furnished. Special cases or trunks of convenient size for handling, in which the above apparatus may be quickly packed and safely transported to the scene of an accident are also necessary.

"The character of the training given should include a general study of the conditions that obtain during and after a mine fire or explosion, with special detailed reference to concrete cases. With these actual occurrences in mind, plans should be

Fig. 2.

discussed for sussessfully solving the problems according to modern rescue practice. The principles on which the machines used at the station are constructed and operate should be explained; and a thorough first-hand knowledge of the manipulation of the various forms of apparatus should be acquired by the miner. The actual training of the mind and body to do work similar to that required in the actual recovery of a mine and in the presence of deadly gases should be given by means of drills in the smoke room. In this way, men become acquainted with the possibilities and limitations of the machines, gain knowledge as to their own prowess as rescuers, and learn to work in squads under the leadership of one of their comrades. For mental and physical ability shown in the work, a certificate of competency should be awarded. This would tend both to keep up interest in the work of the station, and to be of especial value as a reference card when a disaster occurs.

"The advantages that obtain from such stations are in a large measure obvious. It often happens in an explosion that the ventilation machinery is thrown out of commission or totally destroyed. Also it is often necessary after an explosion to stop the fan to prevent a series of subsequent blasts and to control a mine fire by cutting off all ventilation. Previous rescue methods have afforded only a choice between two evils: either close the mine with concrete stoppings and leave it sealed indefinitely, or start the fan, send in the men and trust to luck, with the result of the loss of many lives and much property. With the introduction of modern practice, however, rescue work assumes a decidedly different aspect. With the aid of the breathing appliances, trained men may enter the mine at once with comparative safety and begin the task of recovery, without aid of air-supply from the fan. As the work progresses, each step may be taken with a complete knowledge of the situation gained from the careful reconnaissance of the helmet men. Not least among the advantages that accrue from the employment of rescue stations, is that in cases of emergency there are available squads of men trained for the undertaking, accustomed to working together and obedient to the commands of their leader. A further advantage is that such rescue stations may become centres for the dissemination of knowledge among the men. In addition to the usual studies and lectures, local institutes may hold their meetings in the observation hall of the station; and talks and demonstrations on first-aid work may be given by the town or company physician with a view to forming First Aid Corps similar to those that are meeting with such success in the anthracite fields of Pennsylvania.

"A station may be built for $5000, and equipped with a complete line of apparatus for a like sum, itemized as follows:

12 oxygen helmets, or other suitable breathing appliances.
12 portable electric safety lamps.
12 oil-burning safety lamps.
6 oxygen tanks or reservoirs.
1 oxygen pump.
2 oxygen reviving outfits.
200 potash cartridges.
1 chemical cabinet for gas analysis.
15 cases or trunks for transporting the above apparatus. Furniture, including chairs, tables, wall cases, etc., tools, and supplies.

"Three stations, as proposed, may be completely installed for $30,000. In charge of each of the central rescue stations there should be a man whose experience in coal mining has been large and varied—someone who can maintain the interest of the miners who visit the station, care for the apparatus, and keep the records. Over the entire rescue work, with power to purchase supplies, direct the course of training, and assume the entire charge in case of a mine disaster, there should be a man who is a mining en-

gineer by profession, one who has had experience in all phases of coal mining, including mine-rescue work, and upon who may be thrown with confidence the welfare of the whole proposition. Each operator should be asked to send a small number, say 1%, of his employees to the nearest of the central rescue stations at least twice a year for training. These men should spend at least three days at the station on each visit. In return for the operator bearing such expense for the safety of the lives of his miners, the men so trained should agree, in cases of emergency, to assist in the work of mine rescue, with the understanding that they are to receive only the inside wage scale for time devoted. The central sta-

serious limitation.

One of the facts which has been made most clear by the work so far done is that to fight fires and gas underground with the new apparatus will require new tactics as well. In the recovery of the Majestic mine in Illinois Mr. Williams cut off the endangered portion by air locks and then, wearing a helmet, went into the gas-filled part of the mine and made an inspection which permitted the recovery of the mine without further accident. It was plainly apparent afterward that attempts by the old methods of breathing and carrying an air current would have resulted in serious disaster. In one of the Pennsylvania mines J. W. Paul by making a quick traverse through

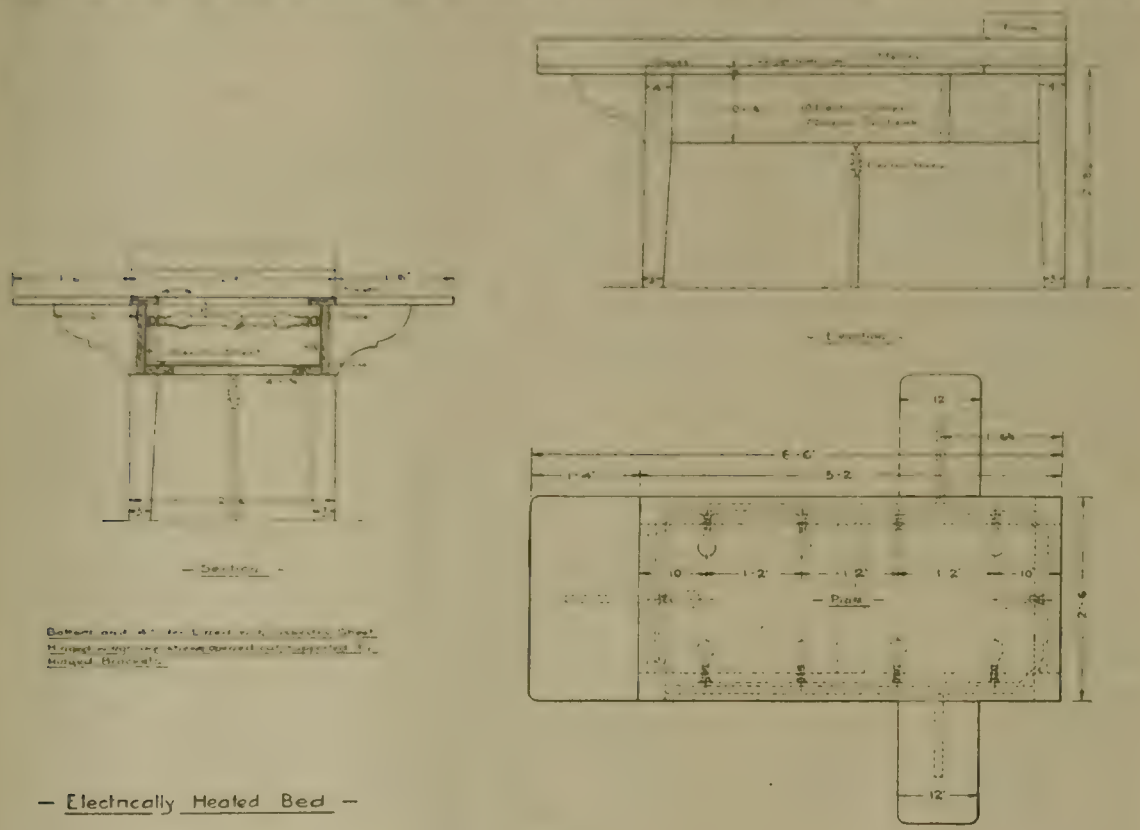


Fig. 3.

tions could be made of great value to both miners and operators."

In the work at Urbana and the other American stations a number of different types of helmet have been tried. The one most frequently used is the Draeger (Fig. 2), a German helmet supplied with compressed oxygen tanks and a device for precipitating the carbon dioxide breathed out by the wearer, the nitrogen being used over and over. With this helmet men can work in the most noxious gases as much as two hours. In Western Australia, where in the gold mines much attention has been devoted to mine-rescue work, the Vajen-Baden and Fleuss-Davis-Hall helmets are the favorites. They are lighter than the Draeger and are supplied with compressed air rather than oxygen but they only permit of one hour's work without renewal of supply. When account is taken of the time necessary for getting to and from the place of work, this is seen to be a

the workings immediately after an explosion, was able to put out incipient fires and even to save lives.

Not only are new tactics called for but trained men are needed. Scientific apparatus may be dangerous rather than helpful when placed in the hands of unskilled men. The new rescue stations will be especially valuable in training men. It is proposed that first-aid methods as well as other rescue work shall be taught. In Australia and Africa the importance of such work is recognized and at Kalgoorlie the St. John Ambulance Association has done much in aid of men injured in the gold mines. In 1906 when the work began on the goldfields, with the exception of a few obsolete stretchers at some of the big mines, practically no provision had been made for the proper handling of the injured. Since then casualty wards have been erected and equipped with up-to-date appliances, and on some of the mines a special ambulance corps is always at hand. Anyone familiar with

accidents underground knows how difficult it sometimes is to extricate a miner from beneath the fallen rocks, and it is in such cases that the rescue corps is of invaluable assistance. After the rocks have been removed the patient is immediately treated for whatever injury he has received and then strapped in a Lowmoor jacket attached and brought to the surface in a vertical position.

The casualty wards are fitted with electrically-heated beds (Fig. 3) hot and cold water, medicine chests, splints, and bandages, and it is here that much can be done to relieve pain before the arrival of a doctor. The electrically-heated bed is a valuable acquisition to an accident ward, seeing that a man brought up from underground wet and cold can be placed between warm blankets immediately, if necessary. The beds are inexpensive and can be made at the mine.

The Association has given great attention to transport work and the mines are gradually being equipped with proper ambulances and litters. It has also instructed a number of men and maintains training quarters for the use of members. Lectures are given by medical men and every effort is being made to induce the mining companies to prepare to care properly for their injured employees. From statistics it is apparent that the majority of fractures that occur underground are simple and if those first on the scene of accident apply suitable splints, the possibility of a more serious fracture is prevented. The broken ends of the bone are so sharp that any attempt to remove the patient without first securing the limb in splints is likely to lead to serious injury. A good improvised method of splinting is to use parts of the side of a candle box or similar pieces of wood tied by means of handkerchiefs, braces, or string. Extreme cleanliness should be exercised in regard to wounds of every description as by thoroughly washing and treating the wound with some antiseptic the possibility of blood-poisoning is considerably lessened. This applies not only to large, but to small wounds.

The pamphlets published by the Mines Departments of Western Australia and South Africa fully describe the proper methods to be adopted when men are overcome by gases underground. The suggestions made by the writers of these pamphlets have been tested, and no difficulty has been experienced in treating bad cases. It has been found that the electrically-heated tables in use are of great assistance in restoring patients suffering severely from shock. Too much precaution cannot be taken in cases of men overcome by gas and the old idea of giving large quantities of alcoholic stimulants is dangerous. The brandy bottle which was so much in evidence in the early days has given place to readily prepared doses of sal volatile. In the United States but little has been done along these lines and it is expected that the new Bureau of Mines will point the way to effective organization by companies or by districts so as to decrease as much as possible injuries and loss of life. In Nevada, the Goldfield Consolidated Mines Co. has recently taken the matter up and has provided apparatus and planned systematic training on a large scale.

HYDRO-ELECTRIC POWER FORMULAE

James H. Wise

*Formulae for quickly determining approximate results in all branches of engineering work are quite essential not only for making rapid mental determinations, but for checking more precise calculations which are not infrequently of many operations and are thus subject to error. Knowing the quantity of water and static head in feet, four very simple rules for determining the hydro-electric output of a power-plant have been developed and are herewith also expressed as equations. It will be noted that three units of water measurement are embodied and the output can, therefore, be calculated direct without conversion.

A miner's inch (m. i.) is taken as 1.5 cu. ft. of water per minute.

(a) 1 m. i. will develop 2 hp. with 1000-ft. head.
(b) 1 min. ft. will develop 1 kw. with 1000-ft. head.
(c) 1 sec. ft. will develop 8 hp. with 100-ft. head.
(d) 1 sec. ft. will develop 6 kw. with 100-ft. head.

(a) Q (miner's inch) $\times$ H (feet) $\times$ 0.002 = hp.
(b) Q (cu. ft. per min.) $\times$ H (feet) $\times$ 0.001 = kw.
(c) Q (cu. ft. per sec.) $\times$ H (feet) $\times$ 0.08 = hp.
(d) Q (cu. ft. per sec.) $\times$ H (feet) $\times$ 0.06 = kw.

The conversation of kilowatt to horse-power or *vice versa*, can readily be made in the usual manner. The value of these equations lies in the fact that losses such as friction or head loss in the pipe, generator, water-wheel, and transformer losses are all taken into consideration, that is, at the values usual in high-head installations of Western practice.

Assuming a pipe-line efficiency of 95%, a water-wheel efficiency of 80%, a generator efficiency of 96%, and a transformer efficiency of 98%, the plant efficiency is 71.5%. Allowing a still further loss of 1.5 to 2% for inefficiency in regulating nozzle losses, etc., the switch-board output will be 70%. Assuming well known constants, the following deduction from one of the formulae may be given:

w = 62.5 lb. weight of 1 cu. ft. water.
1 hp. = 33,000 ft. lb. per min.
1 m. i. = 1.5 cu. ft. of water per min.
Q = quantity of water.
H = static head from forebay to centre of nozzle for impulse wheels and from surface of head-water to tail-water surface in the case of turbines.

From the well known equation P = QwH may be calculated P or hp. $= \frac{1.5 \times 62.5 \times 1000 \text{ ft.}}{33{,}000} \times 0.70 = 1.990$, or practically two horse-power. The approximation being large by one-half of 1%, the other formulae are obtained directly or deduced from the foregoing.

A practical application of the formula is as follows: Assume the Chalf Bluff ditch is furnishing the Deer Creek power-house continuously with 3500 m. i. of water, the head is known to be 830 ft. Therefore $3500 \times 830 \times 0.002 = 5810$ hp. or $= 4360$ kilowatt.

Laterite is a rock containing free aluminium hydrate usually associated with hydrates of iron and manganese and oxide of titanium. Being a product of weathering, its formation requires a moist climate and abundant vegetation.

*From *Pacific Gas and Electric Magazine.*

Discussion

[illegible]

Decrease of Value in Ore-Shoots with Depth

The Editor

Sir—My attention has recently been called by a prominent mine manager to the fact that in nearly all great gold mines there is a gradual decrease in the tenor of the ore as depth is attained, with a suggestion that this has been overlooked by economic geologists. I do not remember to have read a comprehensive discussion of it, and I desire information on the subject. It is, of course, a well known fact that a gold mine is first opened on the oxidized ore near the surface, which has commonly been enriched by mechanical concentration. Then in some veins the upper portion of the sulphide zone may have had its average tenor increased by the secondary enrichment process. But after the mine workings have penetrated beyond the influence of the surface, is there, as a general rule—of course recognizing many exceptions), a further gradual decrease in the gold content of the vein as depth is attained? I have generally attributed the decrease in tenor of the ore mined as the operation attains age to the reduction of working costs and increased capacity of plant, enabling and often requiring the mining of lower-grade ore, and also to the fact that as the commercial ore is usually in the form of shoots limited vertically as well as horizontally, it becomes increasingly more difficult to find new shoots at depth. In large veins a shoot of ore may extend down 1500 ft. or more and then pinch out. A new shoot may begin at about that level somewhere else on the vein, and it may or may not be found by the exploratory work carried on. In the meantime the mill crushes a lower and lower grade of ore from reserves until some time after the mine has ceased to be profitable. These facts, which I believe no one will dispute, tend to obscure the problem. In not a few veins even where the ore-shoots are vertically elongated, there is a sort of horizontal banding, certain levels being much richer than the levels above and below. It is also quite common for the tenor of ore to greatly change upon a vein passing from one formation to another. I have in mind at this moment the fact that at many old mines in the Great Basin region veins have become of much lower grade upon passing from the Tertiary volcanic rocks to underlying granite. This may be anticipated by a geological study of the locality. The question is whether in the majority of large gold-quartz veins, if 5000-ft. depth of the vein below the enriched portion near the surface be divided into 1000-ft. vertical sections, it will be found to be a rule that there is a progressive decrease in tenor of all the ore in each successive deeper section; in other words, as most gold-quartz veins have been filled from below, is it a rule that their primary ores decrease in tenor toward the source of the gold? This has a practical bearing, for if it be true it is necessary in judging a partly developed mine to take it into account in addition to the decrease in favor of ore mined we naturally expect for the known costs given above. If there be such decrease it may be possible to determine approximately the average rate and apply this in investigating prospects, the only question remaining being as to whether any given prospect is one of the exceptions, the safe way would be to assume that it is not, except where the known geology presented evidence that it is. I believe this is a subject worthy of extended study.

Oscar H. Hershey

Kellogg, Idaho, June 30.

The problem Mr. Hershey suggests is most important. We think he is right in his surmise that the apparently lower grade of ore mined with increasing depth is to be referred to secondary agencies having enriched the surface ore, or within the limits of usual mining, decreasing costs having permitted the handling of leaner material. We doubt whether, in the case of a primary orebody, there is sustained evidence of a general change in richness in any direction. However, the matter is open to question and authentic data are much needed. Who will present some tangible evidence? Only from a multiplicity of observations can any rule be deduced.—Editor.

Crushing by Stages

The Editor:

Sir—The suggestion made editorially in the current issue of *The Mining Magazine*, based on the views held by Edward J. Way, that a combination of heavy and light stamps should prove to be advisable, seems to me a valuable one, and it would not surprise me to see, before long, not only a combination of two, but possible also of three, and, in exceptional cases, more sizes in operation, to be followed by tube-mill grinding. The modern practice of comminution has been a source of astonishment to me for many years, believing, as he does, that the weight of the tool should be proportioned to the size of the material. To grind rock down to 40-mesh with a 100-lb. stamp, or a 1000-lb. muller, seems as unscientific as it would be to cut a watch wheel in a 48-in. lathe. There is no getting around the fact that for correct grinding it is necessary to select the weight of the hammer, or rather its energy, so that it is just sufficient to crush the particles to be ground, and, as a corrolary, that all particles smaller than those suitable for each machine be removed before admission to it. This principle is interestingly illustrated in the construction of the Hardinge conical tube-mill (to use this, apparently unavoidable, misnomer), the ingenuity and efficacy of which the mining fraternity is so slow in recognizing. To what extent these principles can be carried economically into execution can only be determined in each case individually, but it is safe to say that they are capable of application to advantage in almost every existing plant, and the nearer approach to perfection in design and workmanship of machinery, and the greater in experience gained in connecting and operating the independent units, the more

of the latter will it be profitable to use, thereby coming closer to the theoretical efficiency. One of the reasons why the stamp-mill, in spite of its faults, has so long maintained its supremacy in competition with other milling devices, is because of its superiority in discharging the ground material. If, then, stamps were chosen so that their weight did not exceed that required to accomplish the breaking of the ore, they would make as economical a crushing machine as can be expected for the smallest sizes, where stamps would become impracticable, and tube-mills, preferably of the conical shape, would take their place.

Fundamentally the stamp which automatically stores a certain energy and re-delivers the same at each blow, regardless of the power required, may not be an ideal machine, but its simplicity of construction and operation will probably assure it the foremost place among medium-sized crushing devices, provided it is adapted to the work to be performed on the lines that have been suggested.

F. CREMER.

Los Angeles, July 6.

Wet Gold-Assay

The Editor:

Sir—I have read with considerable interest Mr. Howson's letter which appeared in your issue of June 25, on Mr. De Luce's wet method of gold assay. In his experiments 7a, b, c, and d, in which a telluride ore is treated with aqua regia and then evaporated to dryness, I should be a little afraid, in so rich an ore as the one he used, that there might be a danger of loss of gold by volatilization of its chloride. It would have been interesting to know if Mr. Howson assayed the final residue and whether he found the whole of the missing 10.6% there.

While on the subject, the following method of assay may be of interest. Though not an assay in the proper sense of the word, it has merit, and, as I have never seen an account of it in any text book, I give it to your readers for what it is worth. It was shown to me by a prospector named Cohen, and, as when he found anything worth while he was in the habit of bringing it to me for accurate assay, I know that he made some fairly close guesses by the process. He was working on low-grade ores, and he took for each test a pound of ore that had been crushed to pass a 100-mesh screen. He first roasted the ore, then added one ounce of doubly-distilled mercury, sufficient water to make a thick mud, shook well in a bottle, and then by careful panning recovered the mercury. Having obtained the mercury, Cohen placed it on a hard-glass watch-crystal and evaporated it gently over a spirit lamp, finally, when all the mercury was evaporated, bringing the glass to a red heat. The gold was left in a thin film on the glass, to which it adhered tenaciously. For the purpose of comparison, he took ores of known assay value and treated them in the same way. The watch glasses—of which he had some dozens—with the gold on them, he carried around with him to compare with tests he made of ores of unknown value. Not only quantity, but fineness—from color—had to be judged.

Of course I am not putting this forward as an accurate test, but for the prospector, as I have said before, it has merit. The only kit necessary is a spirit lamp and support; watch-glasses, which may readily be cleaned after the test with a few drops of HCl and a crystal of $KClO_3$ or $K_2Mn_2O_8$; mercury; an iron pan for roasting, which operation may be done over an open charcoal fire; and the comparison watch-glasses.

F. H. MASON.

San Diego, California, June 29.

Thawing Giant Powder

The Editor:

Sir—I have used a common chicken incubator for the past two years for thawing giant powder, with most gratifying results. It has the following advantages: (1) there is a dry even heat, just what is wanted for powder; (2) no danger of overheating; (3) the powder is always ready; (4) the time saved is worth many times the cost of the machine; (5) always having the powder in prime condition for firing, you will get the very best results; (6) the cost of fuel is low; (7) last, but not least, it is perfectly safe.

Now, Mr. Miner, or powder user, don't laugh at this method, but just try it, and be convinced that an incubator can't be beaten for a safe and economical method of thawing explosives. Don't rush off and buy a new one, but enquire of your neighbors. Most likely you will soon find one that will answer your purpose just as well as a new one, that can be secured at a very moderate price. I have never had to change the regulator on my machine, and my powder is always in the very best condition for use. I feel sure that if incubators were used for the thawing of explosives the number of accidents would be greatly lessened.

A. L. LAMB.

Ashland, Oregon, July 6.

The Cheapest Mining.—The cheapest mining and milling of gold ore in California, that has been recorded, was done at the Spanish mine, near Washington in Nevada county. The ore was mined in an open-cut, trammed through a tunnel to the mill, which consisted of a Blake rock-breaker and three Huntingtons. There were employed 3 white men, one of them as foreman, and 8 Chinese. This crew broke all the ore and sent it to the mill, handling 4000 tons per month, and milled it at a cost of 58½c. to 60½c. per ton, the ore assaying about $1. This statement includes only the actual cost of breaking the ore, tramming and milling it, no account being taken of the cost of the tunnel 1200 ft. long which had been run previously, at a probable cost of $6000, nor did it take into consideration the cost of a raise 350 ft. high, which no doubt cost $1500 more. Had the total cost of this 'cheap mining and milling' been charged with the cost of the work previously done by others, the operation would have been at a loss, but as it happened, one set of men paid for the preliminary work, another set for the mining and milling—the latter at a profit. This instance illustrates how comparisons of costs to be valuable must take into account all the circumstances.

Concentrates

Coal dust ground to pass 200 mesh will explode on contact with flame or an electric spark.

Nitroglycerin is prepared by slowly running glycerin into a mixture of the strongest nitric and sulphuric acids, the whole being stirred and kept cool during the process of mixing.

Exports of manganese ore from Russia during the year 1909 amounted to 611,000 tons, as compared with 440,000 in 1908, and 608,000 in 1907, showing an advance last year of 171,000 tons over the previous year, and of 3000 over 1907.

Rope drives have replaced both belts and gears in a number of large plants, both efficiency and economy being claimed by the advocates of the drive. Flexibility and lack of broken gears due to sudden changes of load are probably the main reasons for the use of rope in power transmission.

Time spent in loading and unloading forms a considerable portion of the expense of shipping when a large amount of ore is to be handled, and a number of manufacturing companies are now building all-steel cars with both side and centre dumps to facilitate rapid handling of the material.

Black blasting powder comes into the market in the form of grains whose edges have been rounded off by rubbing together in a revolving barrel and which are usually coated on the surface, or glazed, as it is termed with graphite, or black lead. The object in rounding and glazing the grains is to render them free running, and the glazing also serves to delay somewhat the taking up of moisture from the air by the grains.

Where the floor of a mine tunnel is very wet and is the cause of much annoyance or expense, drainage may be accomplished by laying common drain tile in a trench cut on either side of the track. The tile need have no flanges and should be laid about an inch apart in order that the water may seep in, which it could not do if the tile sections were closely joined. Where this expedient has been tried it has been found to work satisfactorily.

Explosives should not be exposed for any length of time to direct sunlight, because this may lead to decomposition in those containing nitroglycerin, nitrocellulose, nitrostarch, or substances of that kind. Explosives should be stored in a dry place, for many of them contain considerable quantities of ammonium nitrate or sodium nitrate and will take up moisture from damp air. This not only makes them harder to fire, but causes a weaker explosion.

Lubricants are tested in six ways: (1) by chemical analysis; (2) for specific gravity; (3) for relative viscosity when new; (4) for gumming action; (5) for flashing and burning points; (6) generally, by the testing machine. The last is the most efficient and in its essential features consists of a pendulum hanging on the test journal whose brasses can be adjusted for any pressure by a screw. The journal being rotated to the right the pendulum moves to the left and a scale at once indicates the friction per square inch of journal.

Steel mine-timbers were placed in the Foxdale mine, Isle of Man, in 1890, and gave great satisfaction. Adjacent sets of Irish larch and Norway pine put in at the same time, failed utterly in less than two years, while the steel under the same conditions was as good as new. They cost twice as much as the timber, but as they would last at least twice as long, they were undoubtedly superior on the score of economy, to say nothing of their other advantages. In the mining districts of Michigan and Minnesota there are a number of mine shafts timbered with steel and lagged with plank. These shaft-sets are made similar to timber-sets and are lowered into position as the excavation proceeds. Every 50 ft. or more steel beam bearers are placed transversely, after which the hangers are removed.

Zinc dust used in cyanidation in this country comes mainly from Germany, though some is now being made at Pueblo, Colorado. The material is the 'blue powder' of the zinc smelters, and consists of finely divided metallic zinc in part covered by a film of zinc oxide. The individual particles are often in a state of tension as in 'Prince Rupert drops,' and hence the material is explosive under some conditions. Blue powder is a troublesome by-product in zinc smelting, and since zinc dust is bought in carload lots by the companies that have adopted the Merrill process, there would seem to be an opening here for a good American business. The ideal zinc dust would consist of 97% metallic zinc and 3 of metallic lead. The freer it is from oxide the better, and it is particularly important that it should be even in composition. Dust from new sources should not be used without thorough preliminary tests.

Tonnage crushed in mills is often estimated merely by count of cars dumped per week or month. This gives at best only a rough approximation to the truth. If a fair proportion of the cars are weighed daily, if moisture samples are taken when the material is not quite uniform in this respect, and if a correction is made periodically for the differences in the volume of the ore in the storage bins, the results are reliable within about 2%. A slightly higher degree of accuracy is claimed for the continuous-weighing devices, which are operated by the pressure on a belt-conveyor, and the accuracy of which can be checked by occasionally comparing the record obtained with a carload of ore weighed by reliable scales. When using these devices the corrections for moisture and fluctuations in mill-storage must not be neglected. When 'mill-time' is used in reckoning tonnage, the time lost while repairing must be carefully recorded, and the results are reliable only when based on past experience of the average duty performed with a particular ore.

Special Correspondence

NOME, ALASKA

Winter Work and Spring Clean-up.—Costs and Labor. — Season Opens Late.—Pioneer Mining Co. Absorbs Miocene Ditch Co. —Seward Peninsula R. R. not Operating.—Stuart-Weatherly makes Heavy Investment for British. — Dredging Plans. — Iditarod News Good.

Although prospecting has been actively carried on in many localities, no new finds of any importance have been made during the past winter. The attractive, but always disappointing belt of tundra lying west of Nome between Snake river and Cape Rodney, was the scene of two or three stampedes during the winter based upon the finding of ancient beach deposits which were the supposed westerly extension of the third beach. Further development, however, proved in each case that while the indications were favorable, the elusive pay-streak was not there. About 300 miners have been steadily employed during the winter by the operators in the immediate vicinity of Nome, and about 250 have been engaged in prospecting by shafts and drifts and in extracting small dumps on their own account. The Pioneer Mining Co., Scandia Mining Co., and the Bessie mine were the leading employers of labor, having on their payrolls more than half the total number employed in this vicinity. The Wild Goose Mining & Trading Co., which has been such a large employer of labor in the years gone by, did not attempt any operations during the winter. The season is opening late. The weather has been steadily cool during May, and thus far, up to the tenth, in June. The hills about Nome are still covered with snow and the water for spring sluicing started two weeks later than usual. The result is that sluicing of winter dumps is just now in full swing, whereas most years this work has been finished by the end of the first week in June. I estimate this spring's clean-up in the immediate vicinity of Nome at about $1,000,000. This is the smallest for several years. Driving operations during the past winter have been carried on in much lower-grade ground than formerly, and while some large dumps have been extracted they do not contain the quantity of yellow metal that similar dumps formerly contained.

The labor union, carefully sizing up the situation early last winter, with rare good sense fixed the winter wage scale at one dollar per day less than had prevailed during the three previous winters, and thus without any friction or dissatisfaction operators were able to secure good labor at $3 per day and board. This condition undoubtedly encouraged some of the operators to attempt the extraction of gravel that has been heretofore considered too low grade to handle. The average cost of working a 2 to 3-ft. pay-streak in frozen ground in the Nome district, placing the pay-gravel in a dump on the surface, and ground sluicing and shoveling it into sluice-boxes in the spring, has been about $4 per yard, and operators have hesitated to attempt to mine ground that sampled less than four or five cents per pan, which is equal to $6 to $7.50 per cubic yard. During the past winter, however, much of the material hoisted averaged only three cents per pan or $4.50 per yard. Louis Stevenson, superintendent for the Pioneer Mining Co., informs me that he has several thousand cubic yards of gravel in dumps this spring mined from a pay-streak seven or more feet thick which averages only $1.875 per yard and yet leaves a profit of $0.625 per yard, allowing for the usual cost of sluicing. This case, however, is exceptional, as pay-streaks of this character are usually only three feet or less in thickness, which necessitates handling about two feet of waste, and as the work was done near an established camp it does not take into consideration the cost of equipment, nor make any allowance for depreciation. Making all due allowances, however, it is still the most creditable showing yet made in this district and brings into the class of profitable ground much territory that has been heretofore considered too low grade to handle.

Though I am not reliably informed as to operations in the Kougarok and Candle Creek districts during the winter, general reports have it that Candle will sluice about $200,000 and Kougarok and Inmachuk about $75,000 from their winter dumps. Gold Run and other outlying districts will probably yield $50,000, making a grand total of $1,325,000 for Seward Peninsula from winter work.

Among the changes in the larger affairs of the Peninsula which have taken place during the winter, one of the most important is the absorption of the Miocene Ditch Co. by the Pioneer Mining Co. The latter company has owned a minority interest in this enterprise for several years, but it has lately acquired control, and henceforth this ditch system, which embraces more than sixty miles of ditches and is capable of delivering between 2500 and 3000 miner's inches of water to the vicinity of Anvil creek, will be entirely in the hands of the Pioneer Mining Co. The price paid and other particulars of the deal have not yet been announced here. The rudest shock which the district has received for a long time was delivered by T. A. Davies, local manager for the John J. Sesnon Co. and the Northwestern Development Co., upon his arrival here on the *Corwin* June 2. The Northwestern Development Co. controls the Seward Peninsula railway, which runs from Nome to Lane's Landing on the Kougarok river and is the only means by which either freight or passengers can reach the Kougarok district early in the season before the ice is out of Port Clarence bay or late in the fall after ice begins to form in the river. Mr. Burroughs, local superintendent for the railroad, started the trains as usual this spring as soon as the track was clear of snow, but Mr. Davies promptly ordered all engines into the sheds the day of his arrival and the road ceased to operate. Whether this stoppage is temporary or is indefinite is not known. The reason assigned by Mr. Davies is that Col. Lionel Stuart-Weatherly, British vice-consul at Nome, and who for some years has been a familiar figure here operating mines on Buster creek and elsewhere, and who is said to have heavy British backing, has secured control of the Northwestern Development Co., and until his arrival here on one of the later boats the railroad and all other Northwestern Development Co.'s holdings will remain in *statu quo*. It is said the railroad has long been losing money, and it is feared by those who have interests in the interior that the tie-up may be indefinite. Col. Stuart-Weatherly is also said to have become the controling factor in the John J. Sesnon Co. This company has a monopoly of the lighterage business of Nome and is the chief purveyor of fuel, both coal and crude oil to Seward Peninsula. It has a monopoly of the crude oil business. Col. Stuart-Weatherly has also taken over the Nome Mining Co. assets, including its electric power plant on Bourbon creek, near Nome, having a 500-kw. generator driven by a steam-turbine engine, and having boiler and building capacity for an additional unit of the same size. With the plant has gone the much discussed Bourbon Creek dredge, which was completed in 1908 and sank after running only a few days. The bucket line caught in the side of one of the pontoons and tore it out, the boat sinking in a few minutes. The hull rested on an uneven bottom and was warped out of shape, so that most of the season of 1909 was spent in re-building and strengthening the various parts of the dredge. It made a short run last season and was said to have made a creditable showing. Seward Peninsula, and especially the Nome district, evidently looks good to the Colonel and his backers, and it is to be hoped that his various enterprises will prove remunerative. His first move was made early in the winter when he acquired by purchase the Nome Electric lighting plant which was owned by the John J. Sesnon Co. Shortly after his arrival in Seattle on one of the last boats from here last fall, word was wired in here to turn over the lighting plant and all stores and equipment to Arthur Gibson, with whom he had arranged to be his superintendent of the plant. This purchase has been followed by the others enumerated, according to our best information here, and it is believed to be the intention of Col. Stuart-Weatherly to greatly enlarge the power-plant and to build and operate dredges in this vicinity and sell power to others.

Unloading Freight on the Ice at Nome.

Wilson, who last year installed two dredges in the Council district, is now to install one on the Casadepaga creek. A. J. Soupje is shipping one for Melsing creek near Council City. C. Sievertson is shipping one for Spruce creek near Solomon. John A. Webb is shipping one for Shovel creek, a tributary of Solomon river. The Pfleu Dredging Co., in which Joseph F. Pfleu of Nome is a large stockholder, and for which he is general manager, is shipping one for Otter creek near Nome. Roland Sutherland, Colin Murray, and Pete Hogan are shipping one to be installed on Moss gulch, a tributary of Nome river, and R. L. Braucht, treasurer of the Gold Beach Dredging Co., which last year installed a dredge on Dry creek near Nome, is shipping one to be operated on the Casadepaga creek. These dredges are all modern substantially constructed machines and of a capacity suited to the character of the ground in which they are to operate. As stated in a former letter there is no doubt among those familiar with Seward Peninsula that there is a splendid field here for dredges of moderate capacity. The most suitable dredging areas are comparatively shallow, ranging between 10 and 30 ft. deep, and dredges having 3 to 5-ft. buckets are likely to be most suc-

stock peddler, and the legitimate promoter, who represents a meritorious proposition that has been carefully tested and proved. Investors should insist upon having an engineer's report covering all the essential facts necessary to the success of the scheme before placing one dollar within the control of the promotor of a dredge scheme.

Favorable reports come from the Iditarod country. Pay-dirt has been found on several creeks, including Otter, Flat, Black, Glenn Willow, and Chicken. Flat creek, a tributary of Otter creek, is said to contain a pay streak 400 to 500 ft. wide, and good prospects have been found along its full length, which is about four miles. A correspondent writing from there recently says: "There is great uniformity of pay. No big pans, none better than 25c., but many holes have shown good prospects, such as nine feet of 6c. dirt and ten feet of 8c. dirt." Of the gold-bearing material he says: "It is a sort of glacial mud, not unlike gumbo, and is most difficult to pan. The rocks are rough fragmental pieces showing but little water wear and these are embedded in the gumbo. The creek is very flat and is not frozen. It will be difficult to get drainage. The average depth is about 17 feet."

TORONTO, CANADA

Porcupine.—High-Graders Convicted.—Cobalt Shipments.

R. W. Brock, Director of the Canadian Geological Survey, has returned from an inspection of the Porcupine Lake area, and his report is on the whole decidedly favorable, though he anticipates a wild boom and many losses through the exploitation of worthless claims. Of the 9000 claims that have been located in this district the majority have no present or prospective value, and many change hands on a purely speculative basis; but there are some really good-looking prospects. Quartz is remarkably widespread, and visible gold in abundance has been found at numerous and widely separated points. The camp is fortunate, he says, in having a number of strong interests take hold in its initial stages, to insure thorough development and testing of the more promising prospects. The prevailing rocks of the district are greenstones (including old diabase), quartz-porphyries, and schists, presumably of Keewatin age, with some slates, greywackes, and conglomerates probably of Huronian age. The quartz seems to occur in any of the rocks, and in all manner of forms. It is sometimes found in well defined veins, and also in large apparently isolated masses, the so called 'domes', and again it occurs as irregular stringers which may swell out in places to large masses. The quartz holds many inclusions of country rock more or less altered in and along which pyrite is extensively distributed. The gold, which is often coarse, is distributed similarly to the pyrite with which it is usually rather closely associated, but some may be found in the pure quartz. A little galena, blende and chalcopyrite may also be present. Next to quartz a ferruginous carbonate, probably ankerite or siderite, is the most abundant gangue mineral and it weathers deeply to reddish yellow iron oxide. The properties attracting most attention are the Timmons, Dome, and Foster. The Timmins has a substantial camp, buildings, and good equipment with three shafts down on the largest vein which has a maximum width of 20 ft. The deepest shaft is down 90 ft. at which depth the vein is 12 ft. in width yielding good ore carrying free gold. There are some 300 tons of ore on the dump, several lots of which sent for sampling are said to have yielded high results. The ore now being taken from the bottom is equal to that on the surface. Several other veins have been stripped, one of which has been traced 300 ft. and shows gold at several points. At the Dome two large masses of quartz 60 ft. or so in width and of considerable length have been opened. The surface of the quartz shows coarse gold and sampling is reported to give satisfactory results. Several shafts have been sunk and diamond-drilling is being undertaken to determine conditions at depth. A small test-mill is being erected. The Foster vein is a belt of iron carbonate filled with transverse masses and veins of quartz, containing many inclusions of the carbonate, in which sulphides and gold have been deposited. The vein where exposed has a width of from 6 to 20 ft. and has been traced for nearly half a mile. Fine showings of gold occur. The development of the camp during the next few months, which will furnish some indication of conditions at depth, will be watched with much interest. The district is now comparatively easy of access, the route generally taken being from Kelso at Mile Post 222 on the Temiskaming & Northern Ontario railway by stage for 12 miles to the inlet of Frederickhouse lake, and the rest of the way by gasoline launches. A service is also being established from the Canadian Pacific railway at Bisco down the Matagami river to a point near the Timmins mine.

The mining men of Porcupine and Gowganda have been for some time urging on the Temiskaming & Northern Ontario Railway Commission the need of an extension of the system into those districts. The Commission after giving the matter full consideration has decided in the negative, and Mr. Englehart, the chairman, a few days since announced that the extensions would not be undertaken at present or in the near future, as both camps had yet to prove their worth, their present stage of development not being such as to warrant extension as a business proposition. The number of high-graders, prosecutions against whom have been hanging fire for some months owing to legal technicalities, were finally disposed of on June 22. The charges of theft were dropped and convictions of illegally buying or selling ore were recorded. J. E. Wilkinson, president of the J. E. Wilkinson Co., the principal offender was fined $300 or six months in jail, three others received sentences of $200 or six months, and two more were let off more easily. These proceedings took place under the old law under which it is difficult to obtain a conviction and most of the prisoners pleaded guilty of the lesser offence. The present provisions are much more stringent and future offenders will hardly escape so lightly. A still more flagrant case has just come to light resulting in the arrest of George E. G. Rogers, accountant of the Lucky Godfrey, of Elk Lake, and an ore-sorter in the employ of the company. Last April a shipment of 18 tons of high-grade ore was made to the smelter. It was valued at $40,000. When the bags were opened they were found to be largely filled with country rock and low-grade vein matter to the value of about $5000.

Cobalt ore shipments are increasing, the consignments for the two weeks ended June 24, amounting to 1750 tons. A good find is reported at the Peterson Lake where a 5-in. lead of smaltite carrying native silver was struck in a cross-cut at 200 ft. The O'Brien has opened high-grade ore in a winze sunk from a drift in No. 16 shaft. The Bailey is down 160 ft. at which depth a station is being cut. The Victoria vein of the Crown Reserve, intersected in May to the south of the main vein, is holding out in width and value. It contains high-grade ore, one assay showing 6000 oz. Another important ore-shoot has been found on the Lawson property of the La Rose in a drift at the 50-ft. level on No. 1 vein. A new vein of high grade has been discovered at the Temiskaming on the 400-ft. level.

The University of Toronto has added a professor of mining to its staff and appointed H. E. T. Haultain to the position. Mr. Haultain's work as a mining engineer and lecturer on mining has amply proved his fitness for the post.

LONDON

Radium Exploitation.—Rezende Gold Mine.—Brakpan Plant.

Some time ago I recorded in these columns that the National Minerals Corporation was exploiting radio-active pitchblende found in the St. Ives mines, Cornwall, and had formed a company with a large capitalization called the British Radium Corporation for the purpose of conducting extraction under the general direction of Sir William Ramsay. We have had another company of similar indefinite promise before the public this week. The name is the National Radium Trust, and the capital is £150,000. The list of directors is headed by Earl Russell. The objects of the company are two-fold: first, to sell or lend radium to medical men and scientists generally, and second, to acquire and develop uranium mines in Portugal. As regards the first object, the price to be charged for the sale is £16 per milligram of pure radium bromide; and for the loan of it the charge will be £4 for 10 mg. for the first 24 hours and 16s. for every succeeding 24 hours. The mines to be acquired are in the State of Veira-Baixa, Portugal, and the mineral containing the radium is variously given in the prospectus as uranite and autunite. Presumably both occur. The green uranite is the phosphate of copper and uranium, and the yellow autunite is the phosphate of lime and uranium. The crude ore is to be sold to a firm in Paris dealing in uranium and radium. Later it may be concentrated and treated at the mine. The actual value of the ore as far as radium content is concerned is not clearly put, though it is stated that the company expects to receive £32 per ton of concentrate containing 3% of U_3O_8. The minerals seem to be disseminated in minute quantities throughout cracks in granite and the uranium content is only a small fraction of one per cent.

The Rezende gold mine in Rhodesia is one that has given English shareholders much anxiety and has for years been a sink for capital. During the last year or two the energies of the Farrars have put a better complexion on affairs. The mine is situated in the Penhalonga valley, in the Umtali

district. It was first worked in 1882 when the Crown Gold fields of Manica undertook its development and the company has been reconstructed several times under different names. More recently control has been acquired by the Fairrar Anglo Exploration group and the company was reconstructed in December, 1909, under the name Rezende Mines Ltd. The capital then issued was 15,000 shares of £1 each, 26,000 being allotted to the shareholders in the old company, 15,645 to pay for additional assets and £7,355 for cash to subscribers to the debentures of which £4,500 was subscribed for the purposes of working capital. These debentures carry 8% interest and are redeemable by ten annual drawings commencing in 1912. The report now issued covers the period from the reconstruction in December, 1909, to December 31, 1910. During this period the attention of C. R. Pinder, the manager, has been largely devoted to development in the mine and to overhauling the plant, and the mill did not resume operations until the middle of October. A new boiler as well as new engines and three centrifugal pumps have been installed electrically, have been installed and the company has also provided funds for the extension of the Penhalonga Company's electric power plant from which current is bought in addition to the company's own plant. A sorting belt and an ore bin-way have been erected. The ore reserve on December 31 was estimated at 52,270 tons averaging 11.45 dwt., in addition 12,742 tons in the old workings averaging 4 dwt. and 1,450 tons is partly developed. During the 67 working days in October, November and December, the 30-stamp mill crushed 7000 tons averaging 8 dwt. and produced 1823 oz., an extraction of 1.05 dwt. Treatment on Wilbees yielded 106 tons assaying 108 dwt. gold and 89 dwt. silver per ton, which were treated by cyanide. The yield from concentrates was 575 oz. In addition 4838 tons of sand assaying 2.28 dwt. and 1286 tons of slime assaying 2.2 dwt. were cyanided and yielded 436 oz. The total recovery was 2834 oz. or 6.3 dwt. per ton. The percentage of recovery was low, but the plant has not been running long and the directors hope for an improvement later on. The revenue was £12,099 or 26s. 10d. per ton milled, and the cost of mining and treatment was £10,074 or 22s. 6d. per ton, which includes £1800 to ward redemption of the development account. During the year £11,872 was spent on development work and £6050 on sinking a new incline shaft. Operations are rendered difficult by sudden and unexpected inflows of water. Since the close of the year development has disclosed other bodies of ore and the outlook is continually improving. It has been decided that it is best for the company to confine itself to the quartz veins and not to undertake the exploitation of the reserve of schistose ore in the old workings. These have therefore been let to tributors.

The Brakpan mine is one of the most interesting of the deep levels in the Far East Rand. It belongs to the Consolidated Mines Selection group and the gold deposit possesses the unusual characteristic of being situated below coal mines. W. L. Honnold is consulting engineer and C. B. Brodigan manager. The deposit has been developed by means of two vertical shafts, one below the other on the dip, nearly a mile apart, and connected by means of an incline. The depths of the two shafts are 3100 ft. and 3700 ft. The reserve on March 31 was 905,726 tons assaying 6.3 dwt., over stoping widths varying from 40 in. to 77 in. and averaging 52 in. Blocks totaling 428,824 tons averaging 2 dwt. have also been developed and are included in the reserve. A decision as to the metallurgical plant was postponed in order to enable the engineers to take advantage of trials of recent improvements, and the final plans were only adopted in March. The work of excavation has been started, and the orders for the machinery have been given. The battery will consist of 160 stamps weighing 2000 lb. and the buildings and bins will be made large enough for an extension of the stamps to 200. The exact coarseness of crushing has not yet been decided. The initial cyanide plant will have a capacity of 60,000 tons per month. Other features of the plant will be classifying cones, air agitation, vacuum-filters, and zinc dust precipitation. A year ago development was hindered by the sudden inflow of water at several levels simultaneously. A speedy pumping plant has been provided at No. 2 the deeper shaft, and the water will be raised in three lifts. The capacity is 1,000,000 gal. per day, and the pump chambers have been made sufficiently roomy to admit of the plant being made half as large again. The balance sheet dated December 31 shows that £214,58 has been spent on No. 1 shaft and its equipment, and £104,320 on No. 2 shaft, the connecting incline has so far cost £34,645. Development has cost £42,889 and £1,200 has been spent on buildings and surface plant. On December 31 the company had £35,273 cash in hand.

SALT LAKE, UTAH

Utah Copper Co.—Ohio Consolidated—Yosemite Mine Drained. Beck Tunnel—Stock Market Depressed

The Utah Copper Co. now claims the distinction of being the largest producing mine of copper in the world. While there are other companies composed of various subsidiaries, notably the Amalgamated which produce more than this company, Utah Copper is producing from one mine and has outstripped Anaconda and the famous Calumet & Hecla. The production for May was well above 5,500,000 lb. and for June bids well to pass the 6,000,000 mark. The work of enlarging the mill capacity will be carried on until the three plants are treating 20,000 tons of ore per day, about 8000 tons more than is mined daily at all of the Butte mines. During the past week the Utah Consolidated began shipping its ore over the new tramway to the Tooele smelter. The company still has a few days' run on its old tonnage contract with the Garfield smelter and will deliver the ore by shipping to Tooele and thence over the new Tooele Valley railroad and the San Pedro instead of by the Denver & Rio Grande, as formerly. As soon as this contract is completed the International will commence receiving the ore. The first reverberatory furnace is now completed and unless something goes wrong the company should be treating ore by the first of August.

F. Augustus Heinze and Colin MacIntosh, manager for the Ohio Copper Co., have gone to Europe in their endeavor to finance the company. It was their intention to visit several of the great financial centres, but it is reported that their mission has so far been successful in London, and that it may not be necessary to proceed farther. The company should have about $1,000,000 to complete its mill and put it in first-class shape.

A drift from the Mascotte tunnel has penetrated the porphyry dike which has held the water in the Yosemite mine, and for the first time in eighteen years the lowest levels in the mine are accessible and the property is in shape to allow of deep development. The Yosemite was worked to the 800-ft. level as a lead mine, but no attention was paid to large low-grade deposits of copper, as the smelters at that time did not accept ore running less than 8%. Two of the old Tintic mines are in hard luck. Much surprise was occasioned when the announcement was made that the directors of the Mammoth had levied an assessment of 10c. per share. The Mammoth is one of the old mines of the district and has paid dividends of about $2,000,000. Some of its ore was sensationally rich and one car marketed a few months ago netted the company $100,000. The ore is pockety and apparently played out. Then the suit which the Mammoth has been fighting with the Grand Central for nearly ten years was decided in the United States Supreme Court and the Mammoth was forced to pay $175,000 damages. A few days ago an accident wrecked the cage and the hoisting engine, and these things occurring one after the other has brought the company to the point of calling on the stockholders for help. The annual report of the Beck Tunnel Co. has been issued, showing that the company operated during the last fiscal year at a loss of nearly $22,000. The Tintic deposits are irregular in their occurrence, and in the case of the Beck have been pinching out, so that the company has been much disappointed in the quantities of pay ore found. An assessment was levied last May, but the management announces that unless the present search for ore on the 100-ft. level is successful the

property must close down. Work of re-timbering the old Victoria shaft has been begun and when it is completed the shaft will be continued downward from the 550 to the 1000-ft. level. When it is in working order the mine will be operated from Eureka, whereas it is now worked through the Grand Central on the Mammoth side of the mountain.

The Kearsarge, one of the early mines of the State, has commenced shipping after an idleness of years. This is one of the mines of Dry canyon, adjacent to Stockton and one of the richest districts of this part of the country at one time. The nearby camp of Ophir is another that has been much neglected, but one of its old mines, the Buffalo Consolidated, is now shipping. After many annoying delays the Gold Springs Mining & Power Co. has succeeded in getting its producer-gas electric plant at Modena in operation. This will supply power for the mines at Gold Springs and Fay, Nevada, and should go a long way toward solving the difficulties with which these districts have been obliged to contend.

As an indication of the way the stock market has been affected by the present conditions, the report of the Salt Lake Stock Exchange is of interest. During the first six months of 1910 the total number of shares sold was 9,526,785, at a value of $2,856,191.75, against, for the corresponding period of last year, 21,205,035 shares of a market value of $11,681,354.97.

MEXICO

Moctezuma Copper Co. – Greene-Cananea Report. — Mines Co. of America Consolidation.

The Moctezuma Copper Co., the Phelps-Dodge organization that owns the great Pilares copper mine in the Nacozari district of Sonora, is at present operating only one of the two units of its 2000-ton concentrator at Nacozari, due to a scarcity of water, though the mine production is being kept up and and some high-grade ore is being shipped direct to the Copper Queen smelter at Douglas. At the concentrator, which was finished at the end of 1908 and is unquestionably one of the finest in the world, experiments with Deister tables are now being conducted with a view to their possible installation.

With the completion of improvements now under way, the possible capacity of the Greene-Cananea reduction works will be 6,000,000 lb. of copper per month. This is the statement of L. D. Ricketts, president and general manager of the Cananea Consolidated Copper Co., in the 1909 report, only recently issued and containing interesting details of Mexico's largest copper enterprise. A second reverberatory furnace is now building, and a battery of five additional boilers will be installed in connection with it; six additional McDougall roasting furnaces have been ordered; two additional 1200-kw. turbines are under contract, and the mines not yet equipped with electrical hoists and pumps will soon have them. The report shows that the 1909 production was 44,547,689 lb. of copper, 933,549.15 oz. silver, and 5877.468 oz. gold. A total of 1,016,536 tons was treated in the year, and the average copper recovery was 2.206%, silver 0.750 oz., and gold 0.0046 oz. per ton. The development during the year amounted to 46,911 ft. The total earnings from copper, silver, and gold, and net earnings from miscellaneous revenues, were $5,510,845.99, with total expenditures of $4,408,286.74, leaving net earnings for the twelve months of $1,102,559.25. The charge against the net earnings for depreciation of construction and improvements was $558,451.87, leaving a net profit of $544,107.38. The present management of the Greene-Cananea is striving for the highest possible efficiency at the minimum of cost, and every move made is with this in view. In 1909 the total cost of mining and beneficiating a ton of ore, including every item of expense until the refined product was sold, was $5.459, as against $5.976 during the six months of operation in 1908, $7.625 in the fifteen months preceding the shut-down at Cananea in October 1907, and $10.21 in the fiscal year 1905-6. The smelting cost per dry ton of new copper-bearing material was $3.09 in 1909, as against $3.86 in 1908, and $6.82 in 1907. However, the cost of producing a pound of copper last year was $0.116, while in 1908 it was but $0.105, but in 1909 the construction charge was higher than in the previous year and there was a big increase in development. The cost of mining was $2.22 per ton, an increase of 9c. over the cost in 1908, but of the sum 9½c. consisted of improvements and equipment installed and charged off, and the money spent in development amounted to at least 20c. per ton more than the same expenditure in the previous year. The introduction of fuel oil has been of great advantage to the Greene-Cananea, resulting in a cut of 50% in power expense per ton of ore. A concession for the free importation of fuel oil was obtained from the Mexican Government

Northern Portion of Sonora.

before smelting operations were resumed in 1908. Mr. Ricketts states that the power costs have dropped in the last two years from over $16 to under $8 per horse-power-month, and that a cost of less than $7, possibly not over $6, per month can be safely expected. Due to the fact of outstanding stock, the Greene-Cananea merger has not yet been perfected, and there exists some misunderstanding as to the present relations of the various companies. The Greene-Cananea Copper Co., the $60,000,000 merger concern organized by the Cole-Ryan interests, owns control of the Greene Consolidated Copper Co. and the Cananea Central Co., two American corporations. The Greene Consolidated, in turn, owns all the capital stock of the Cananea Consolidated Copper Co., the Mexican organization that has the smelter and other reduction works and the principal mines at Cananea, and 60% of the stock of the Sierra de Cobre Copper Co., the Mexican concern holding title to the Indiana-Sonora mines, purchased last year from the Phelps-Dodge interests. The holdings of the Cananea Central consist of all the capital stock of the San Pedro Copper Co., a Mexican holding concern; control of the Cananea Duluth Copper Co., an American concern, and 40% of the Sierra de Cobre. The Mexican holding company of the Cananea Duluth is the Cananea Development Co. If the merger is perfected the Greene Consolidated, Cananea Central, and Cananea Duluth will pass out of existence, the Greene-Cananea controlling all holding companies in Mexico.

The latest Mexico mine merger is one of much importance, concerning as it does the Mines Company of America, owning the Creston Colorado mines in Sonora; the Dolores Mines Co., operating the Dolores gold mines in western Chihuahua, and El Rayo Mines Co., with producing properties in the Parral district of the latter State. The merger plan calls for an increase in the capital of the Mines Company of America from $2,000,000 to $9,000,000, and the exchange of this new stock for stock of the other companies, 10 shares for each one of Dolores and 7 for each one of El Rayo. Dolores has 400,000 shares, par value $5, all of which stock is outstanding, and El Rayo 500,000 shares, par value $2, 352,000 shares of which have been issued. In 1909 the Mines Company of America paid in dividends $340,000, and the Dolores $462,896, and in the year ended with last October, El Rayo distributed to stockholders $137,089. Men interested in the U. S. Steel Corporation and the U. S. Realty Co. are principally interested in the Mines Company of America and the Dolores, while El Rayo is controlled by William B. Thompson and W. Hinckle Smith, of Philadelphia.

AUSTIN, TEXAS

Revision of State Mining Law — Leasing System Probable for Coal and Oil Lands

The demand for a revision of the Texas mining law or rather the enactment of an entirely new measure is so great among the men who are interested in developing the mineral deposits of the State that it is probable Governor Campbell will urge the subject to the legislature at its special session, which will convene July 12. J. J. Robison, commissioner of the General Land Office, who has charge of the sale of the State's mineral lands is urging the Governor to give the matter consideration and it is stated that the latter has promised to do so. If the legislature acts speedily upon the specific matters for which it has been called the subject of mining legislation will be submitted. Under the present law even the minerals upon the land sold for grazing or agricultural purposes are reserved by the State. This fact precludes prospecting or developing work being carried on by the present owners of the land or others. The statute made no provision for the land owners buying the minerals upon their respective tracts of land and an enormous amount of ground is therefore lying idle for want of an incentive to develop it. In order to further encourage the development of the State's mineral resources, Mr. Robison recommends that where the State owns mineral lands that have been sold to private individuals provision be made in the law for the prospecting of these lands by any person who may desire to do so in the event the person owning the land does not seek to develop the minerals thereon. He favors the operation of coal and oil lands on the royalty basis, the State to receive a certain percentage of the revenue obtained therefrom. He does not believe that it would be feasible to apply the royalty basis to gold, silver, copper, or quicksilver, and he advocates the State selling its title to these minerals outright. Mr. Robison is now employed in drafting a bill embodying his various suggestions, and it will be submitted to Governor Campbell for approval and recommendation to the legislature.

KALGOORLIE, WESTERN AUSTRALIA

Impoverishment of Ore with Depth. — Lake View Consols-Hannan's Star Consolidation.—Experiments with Wood Stave Pipes.

In consequence of poor developments in some of our mines the share market is depressed and there is anything but a satisfactory feeling. Diamond drilling from the 1900 ft. level in the Associated has so far resulted in no payable ore being cut and ordinary stoping operations do not reveal much good ore. After making a loss for three months, a profit of $6800 was made during April. Only 60 men are now employed on the Associated Northern Blocks against 130 who were employed during the past six years. The mine may last for a few months longer. The South Kalgurli has a drop in its yield this month due to a temporary impoverishment of the stopes. The Lake View Consols profit is down. About $4200 of its usual profit comes from the retreatment of old dumps. The diamond drill at the 2650 ft. level in the Edwards shaft of the Great Boulder, cut ore at 117 ft. west of the shaft, being 21 in. worth $5.04 per ton; and being about 5 ft. from the Golden Horseshoe boundary. At the main shaft, the west cross cut at 2650 ft. cut ore 63 ft. from the shaft, being 6 ft. wide worth $3.48 per ton. These results are not very satisfactory, but further driving will probably open a better grade. The Ivanhoe publishes its ore reserves as 1,007,798 tons, averaging $10.96 per ton; the South Kalgurli 156,929 tons at $6.72; and the Golden Ridge 60,000 tons at $11.52 per ton. The Kalgurli is now sinking from 1750 to 1950 ft., and the Perseverance is also sinking to 2200 ft. from 2050. The Lake View Consols-Hannan's Star Consolidated amalgamation is now complete. The former has a 75-head mill, embodying concentration, tube-milling, bromo-cyanide treatment, and filter-pressing, while the latter has an out of date plant. The mines are not close together, being about one half mile apart, so an aerial tram will probably be necessary to transport ore to the Lake View mill. As a result of an investigation into the [illegible] of chlorine among [illegible] of the Northern Goldfields, it is shown that the [illegible] to the extent. Investigations in other districts will [illegible].

J. M. Maclaren's investigations on the coast at Lennon and Eso Bawn show that the [illegible] gold is appreciable quantities and should be [illegible] wood. Producer gas plants continue to be [illegible] small mines on the goldfields with really [illegible] The engines require a minimum of attention and [illegible] low. There is much rivalry between the various makers, the most prominent being the Crossley, Hornsby, National, Royston, Proctor, and Langyel.

The water used about the mines seems to corrode iron pipes very quickly, especially in the mills where hot water is always in circulation for the roasting plants, etc. Trials of wood pipe made by a firm in Sydney, New South Wales, are being started, and it would seem from experience in other places that, provided the outside of the pipe is protected, the water will not harm the inside in any way.

During April the principal mines yielded as follows:

Name	Tonnage	Value	Profit
Associated	11,575	$ 76,000	$ 6,800
Associated Northern Blocks	2,765	19,500	1,500
Chaffers	4,128	32,300	3,400
Golden Horseshoe	25,577	216,000	47,000
Golden Ridge	2,100	31,000	14,000
Great Boulder Proprietary	17,741	240,000	127,500
Great Fingall	10,561	78,000	11,500
Hainault	6,115	40,500	7,500
Ivanhoe	19,325	204,500	100,000
Kalgurli	10,760	140,000	76,000
Lake View Consols	9,850	66,000	7,000
Oroya Brownhill	20,520	28,000	15,000
Oroya Black Range	4,550	45,000	14,000
Oroya Links	11,186	75,000	16,500
Sons of Gwalia	13,492	116,000	46,500
South Kalgurli	9,270	52,000	4,200

BUTTE, MONTANA

Barnes-King Closed. — North Butte-Tuolumne Suit Started.

The Barnes-King gold mine at Kendall has been closed, and it is believed the last effort to secure any return for the money invested by the stockholders has been made. Stock can be purchased for less than 50c. per share, although it is estimated that with the cash in the treasury, amounting to something over $250,000, machinery, and other assets, it is worth about 53c. Three years ago the promoters of the Barnes-King came in for much abuse, and it was claimed that fully $400,000 was made by those on the inside in the purchase and flotation. Sellers Largey, president of the State Savings Bank of this city, recently sold at public auction 15,000 shares of Davis-Daly stock and 2500 shares of Mexican Consolidated Mining & Smelting Co. stock owned by J. A. Coram, which he placed in the hands of Mr. Largey to secure a loan, the total sum for which the stocks were held amounting to $101,000. The Davis-Daly stock brought $1.05 per share and the Mexican stock 50c. per share, so it will be seen that Mr. Largey's investment was not a very profitable one.

The long expected litigation between the North Butte Mining Co. and the Tuolumne Copper Mining Co., over what is known as the Jessie vein, has been started in the District Court at Butte by the North Butte company, which demands an injunction against the Tuolumne to stop it from mining on the Jessie vein anywhere outside of the little strip of jointly owned ground, and for an accounting of the ore taken out from the strip in question. In a voluminous complaint the North Butte company sets up its title to the Jessie claim and vein, and describes the various underground workings upon the vein to show the continuity of the body from the lowest workings to the apex within the side lines of the Jessie claim of the North Butte company. The complaint relates the points of controversy and says that unless a court of equity grants an injunction a great multiplicity

of suits will be necessary, and that even then the controversy could not be determined thereby. Therefore the court is asked to issue an order on the defendant company to appear and show cause why a temporary injunction should not be issued pending the final determination of the controversy. The court is asked to quiet the North Butte company's title to the vein and to decree that it owns the apex, but no preliminary restraining order is asked for. In a second cause of action the North Butte company sets up its title to a three-eighths interest in what is designated as the Jessie Strip, a long narrow triangular strip in the northeast corner of the Tuolumne claim, which was purchased by the North Butte from one of the original owners of the Tuolumne about a year ago, the Tuolumne company not having been aware of the fact that the interest was outstanding. The complaint relates that although the North Butte is a joint owner of that strip, the Tuolumne company has been mining it without the consent of the North Butte, and has taken out large quantities of ore since September 16, 1909. On March 26 last a demand for an accounting was made on the Tuolumne, and on April 18 a refusal was made, the Tuolumne at the same time denying the rights of the North Butte as to the Jessie Strip. The North Butte therefore demands an accounting through the courts, a judgment for its portion of the profits, and for a decree quieting its title to three-eighths of the Jessie Strip.

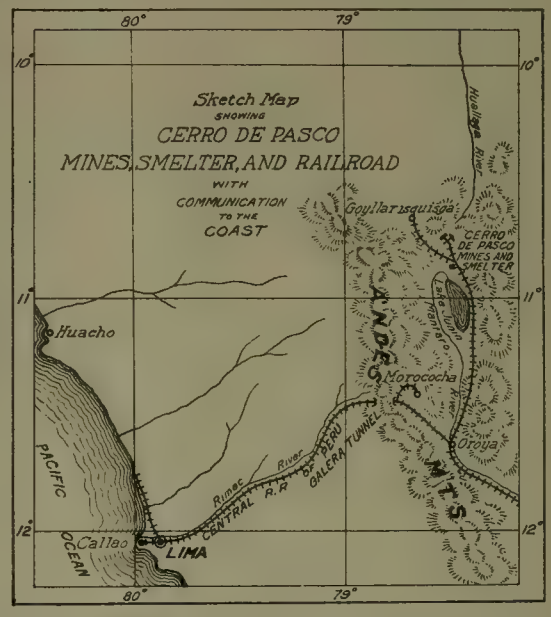
Stephen R. Dow, president, R. M. Edwards, general manager, and A. L. Wyman, secretary, of the Corbin Copper Co., are making an inspection of the property of the company, and advices from Wickes are to the effect that the officers are well satisfied with the progress being made in development. The 100 ton concentrator recently constructed is in operation and is doing good work. The Bonanza adit, at the mouth of which the mill has been built, has been opened into a fine body of ore and a winze recently sunk to a depth of 20 ft. below the adit-level, has opened a body of silver ore assaying over 150 oz. per ton.

NEW YORK

Shrinkage in Leading Stocks.—Arizona Copper Co.—Chino.—Ray Con.-Gila Merger.—Hedley Gold Mining Co. Stock Listed.—Cerro de Pasco.

The market condition here is becoming acute, the shrinkage in values is appalling. Granby, one of those that started the big declines in copper, sold down to $20 this week, as compared with its recent price of $112½. There are declines all along the line, the aggregate running into fabulous sums. Utah Copper sold at a high market of $66 last year; a recent low mark of $39⅜ means a market loss of $41,000,000 on its outstanding stock. The shrinkage in Amalgamated from its high mark of last year, $96½, as against a present low of $57, shows a loss in market value of $60,265,590. Taking the principal copper companies handled in the New York and Boston markets, comparisons between high marks of last year and the present low prices, the staggering total, in round numbers, is $335,000,000. In making this calculation only thirty-eight issues were included. How many times this total must be multiplied to cover the entire industry is beyond practical calculation. Whether or not a combination is being patched together is unknown, but the general impression is that war has been declared with the oft quoted proviso as to fighting along this line if it takes all summer. No important deals are known to be under way, though some little importance is attached to the presence of John Gill, of Edinburgh, in New York. Mr. Gill is chairman of the board of the Arizona Copper Co. He is accompanied by William Exley Miller, secretary of the board, and is thought to be negotiating further with J. D. Ryan, who desires to obtain the Arizona if the price can be agreed upon. Mr. Ryan and Mr. Gill were close to making a deal last February, when Mr. Gill was in New York, about the time the copper merger was thought to be completed. The deal was called off at that time because of the failure of the merger plans. The Arizona Copper Co. is known among engineers as the 'scrap heap' or the 'junk pile' on account of its antiquated equipment. It produces about 30,000,000 to 35,000,000 lb. annually which is sold by the United Metals Selling Co. With its plant rebuilt it would be an important addition to the chain of Cole-Ryan-Amalgamated Copper properties. Mr. Gill's presence in New York is said to be partly due to a contemplated plan for the erection of a new smelter to be owned jointly by the Arizona, the Shannon, and the Detroit. It is said that the officials of the three companies have been in consultation in reference to the plan. In view, however, of the well known fact that the Arizona is for sale and the further fact that the Phelps-Dodge company is amply prepared to treat all of the ores from the properties it controls, this story is thought to be mostly an excuse to hide the real negotiations which may be on.

The first annual report of the Chino Copper reveals some very modest claims as compared with the statements of Thomas W. Lawson, of Boston, made just after the completion of the deal which took the Santa Rita from his hands and converted it into the Chino Copper Co. The present partly and wholly developed ores amount to about 12,000,000 tons, the average copper content being 2.59%. Transportation is to be provided by the Atchison, Topeka & Santa Fe, with which road a contract is just being completed for the construction of nine miles of road to carry the ores from the mine to the mill. The output is expected to amount to between 35,000,000 and 40,000,000 lb. when the mill and plant are completed. Copper costs are figured at nine cents as a maximum. Good progress is reported in the Ray Consolidated-Gila merger. Of the 600,000 shares of Gila outstanding it is said that all of it has been exchanged save about 40,000 shares which is held abroad. The time in which to make the exchange has been extended thirty days to allow this stock to be sent in. The shares of the Hedley Gold Mining Co., which owns the Nickel Plate mines at Hedley, British Columbia, have been listed on the Boston Stock Exchange. The company has paid three dividends aggregating $108,000; it is controlled by officials of the United States Steel Corporation. The Cerro de Pasco Mining Co., of Peru, reports a production of 35,000,000 lb. for the year ending June 30. This company is backed by a group of prominent financiers, including J. B. Haggin, J. P. Morgan, H. C. Fricke, and the estates of D. O. Mills and W. R. Hearst. The Cerro de Pasco has cost its owners a great deal of money, estimated at possibly $20,000,000. The property is at present under the management of A. B. W. Hodges, who was formerly in charge of the Granby. Some stories are beginning to come down from Porcupine which have the ring of a boom camp. The Timmons shaft is said to be down 100 ft. with the richest ore yet discovered in the bottom of the shaft.



General Mining News

ALASKA

(Special Correspondence.)—Shipments of ore from the mine of the Mt. Andrew Iron & Copper Mining Co. have aggregated 2,000 tons. The ore amounts to 2,000 tons per month to the smelter at Ladysmith, British Columbia. The ore samples 50% magnetic iron, 1% to 3% copper, 1% lime and 8 to 10% silica. It was formerly believed that the Mt. Andrew had a blanket vein, but development in the last year has demonstrated that the ore body, first opened on the 60-ft. level, is equally strong in width and grade at a depth of 185 ft. Much of the ore being stoped now is taken from the 150-ft. level. The ore is so even in its iron content, as well as copper, that a ready market is afforded. It is said there will be bids on this ore for one of the Utah smelters.

Alaska.

The marketable copper iron ore is found here in bodies as wide as 150 ft. below an iron cap. The property has two steam boilers, two air compressors and a hoist which is operated by compressed air. The ore is transported from the mine to the ore bunkers over a 3600-ft. aerial tramway, by which 200 tons per hour can be delivered. Henry Ballou, formerly of Butte, became superintendent last May. M. D. Haynes and S. Lichtenstadter of Seattle are among the most heavily interested in the company. There are 127 men on the operating force.

Ketchikan, July 9.

ARIZONA

COCHISE COUNTY

Four feet of ore assaying about 10% copper shows in the face of the drift on the 120-ft. level of the Whitetail at Paradise; the drift having been run 45 ft. from the shaft. In the east drift the ore is 6 to 18 in. wide and is lower in grade. —A small force had been started at the Bermoudy. — In the face of the cross-cut at the 110-ft. level of the shaft on the Cummings and Walcott claims near Courtland, a 4-ft. vein of lead-silver-gold ore has been opened.

MOHAVE COUNTY

The shaft at the C.O.D. mine is expected to reach the 300-ft. level in a few days when drifts will be started to block out the ore on that level.— The smelter at Needles received a carload of high-grade ore from the Redemption recently. ——Nine tons of ore shipped to the smelter by Robert S. Roe from his property in the Weaver district assayed 29% copper with a high silver content. Another lot is on the dump at the mine and will be forwarded in a short time. ——Construction on a 900-ft. spur from the Western Railway of Arizona to the town of Mineral Park is under way, and it is understood that it may be built to Mineral Park canyon, where an ore-bin will be erected.——The drift on the 150-ft. level of the Keystone mine is being driven west into new ground and it is now in the best ore found on the property.

YAVAPAI COUNTY

The Copper Queen Consolidated Mining Co. of Bisbee has secured a bond on the Mescal group at Prescott for $100,000. The option runs for one year and during that time the company is to sink two 100-ft. shafts and do development on the ore. If the property proves satisfactory, bonded calls for the payment of the purchase price in three installments of $10,000, $20,000 and $70,000. The ore body is reported to be several thousand feet long and about 100 ft. wide, the ore being a disseminated chalcocite that assays about 3% copper with occasional streaks of high grade.

CALIFORNIA

AMADOR COUNTY

(Special Correspondence.) The reopening of the Lincoln mine at Sutter Creek will be watched with great interest by all mining men on the Mother Lode. The mine in its early history was famous, producing $2,500,000 to a depth of 350 ft. at which point the rich orebody was cut by a fault and the downward continuation of the vein has never since been found, although the shaft was sunk to a depth of 2000 ft., and thousands of feet of driving and cross-cutting has been done. There is a difference of opinion among those familiar with the mine as to the probable position of this ore-shoot below, some believing it to lie to the eastward, while others think it is in the west country. Geological indications point strongly to the west as the probable region in which it will be found.

Sutter Creek, July 11.

CALAVERAS COUNTY

The adit at the Peck ranch near Mokelumne Hill has opened a vein of free-milling ore. —The 40-stamp mill which the Utica Gold Mining Co. is building at the Golden Cliff mine at Angels Camp is rapidly nearing completion and will be in operation in a short time.

MODOC COUNTY

Brown & Bassler have installed a whim at their Big Four lease in the Hoag district and are sinking on ore that assays $20 to $40 per ton. They have just completed a wagon road to the new Wall mill and will soon be shipping their ore. —McClearly & Schauer have opened a $60 shoot on the Mountain Sheep claim.

NEVADA COUNTY

Special Correspondence.). -F. O. Parker, representing the Golden Eagle Gold Mining Co. of Los Angeles, has purchased the Mitchell claims on Deadman flat, and a half interest in the West Point mine. The West Point adit will be retimbered and driven ahead. It is also planned to sink a central shaft to a vertical depth of 500 ft. ——James Neal of Butte, examined the Polar Star, adjoining the North Star properties, last week, and is understood to be considering the resumption of activities.— — The North Star Mines Co. is working on its holdings on Cincinnati flat, in addition to the regular development. —The California stockholders of the Black Bear Mining Co., owning property near Grass Valley, have commenced suit against the company for the return of 150,000 shares of stock, claimed to be illegally held.— —The Champion Gold Mining Co. has filed suit against the Champion Mines Co. to recover the property, also for damages amounting to $50,000. The plaintiff company is composed of Chicago men, and was dispossessed last spring, following a dispute regarding the question of payments on the bond. —A shoot of milling ore has been opened near the 400-ft. level of the Prescott Hill property of the Sultana group.

Grass Valley, July 13.

Samples of the ore at the bottom of the 90-ft. shaft at the Lucky Star mine near Rough and Ready assayed about $15 free-milling gold with considerable concentrate. There are nine men working at the property and good progress is being made in the shaft which is being sunk on the vein. The ore has averaged four feet in width. —The new compressor at the Fruitvale mine at Moores Flat is being installed at the plant and will be ready to run by the first of August. There is a large vein in the face of the adit and

the installation of the compressor will be of material aid in development.

PLACER COUNTY

There are about 40 men on the payroll at the Big Dipper group. The old mill has been put in good running order and is handling gravel drawn from chutes No. 15 and 16. ——A new mill is being erected at the Brun mine.——Work was suspended at the Hidden Treasure for a few days on account of a cave.

SHASTA COUNTY

The Mammoth Copper Co. at Kennett has completed the bag-house that is designed to destroy the smelter smoke, and resumed operations. The structure is 250 ft. long and 75 ft. wide, and divided into five compartments each containing 600 bags. These are 30 ft. long and have a diameter of 18 in. Two 400-hp. motors will be used in operating the plant.

SIERRA COUNTY

The Independence mine on Wolf creek three miles east of Alleghany has been bonded to a group of Eastern capitalists. The Independence is one of the old mines of this portion of the county and was a profitable enterprise in early days. The shaft will be unwatered, and a new hoist and pump installed.——J. D. Beggs, manager of the Kate Hardy, brought three sacks of ore valued at $1000 to Forest from the rich shoot that was opened a short time ago.——Owing to the failure of the brakes on the hoist at the Alaska mine near Pike City the skip was dropped from the 400-ft. level to the bottom of the shaft killing two miners who had started to the surface.——The last payment of $10,000 on the bond of the Bear Creek mines was made in Alleghany a few days ago by J. W. Evans and associates.——A crew of men has been put to work at the Bullion mine near Sierra City which was bonded recently to Charles R. Thompson. ——At the Carson mine in Slug canyon sinking has been resumed in the bottom of the 30-ft. shaft. A drift was run at this point opening free-milling ore.——A gasoline engine has been installed at the Uncle Sam mine above Forest, and the shaft is being unwatered and retimbered.——Charles Brown has secured a bond on the Watson claims in Coyote canyon.——The drift on the vein at the Tightner opened a shoot of high-grade ore portions of which are almost pure sulphide at a distance of 400 ft. from the adit.

TRINITY COUNTY

A 7-ton motor truck has been installed to haul the freight from Delta to the Headlight mine at Carrville. Up to this time all freighting has been done with teams and the installation of the truck is expected to cut down expense and hasten the work.——The Larsen brothers have commenced work at the Quimby mine in the northern portion of the county and are erecting a cyanide plant to treat the pulp from the 30-ton mill.

YUBA COUNTY

The Natomas Consolidated Gold Dredging Co. has commenced work on the new construction camp on the Yuba river where it will build the largest dredge in the world. The hull will be five feet longer than that of the Natomas No. 8 which is 150 ft. long and carries a chain of buckets having a capacity of 13½ cu. ft. each. The new boat will be known as the Natomas No. 13 and carry the same size buckets as No. 8.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence).—The new buildings at the Homestake property on Lincoln mountain have been completed and a contract will be awarded to drive the adit 100 ft. farther. A. L. Stephens the manager is preparing to start the construction of a milling plant that will have an initial capacity of 25 tons per day.——Machine drills were brought into use last week by the Clear Creek Mining & Leasing Co., which is putting through a raise on the Frostberg vein to connect with the upper workings. There remains 250 ft. of ground to be broken.——The mill at the Wilcox adit in East Argentine district was temporarily closed July 1. A number of improvements are to be made in the adjustment of the machinery. The Chilean mills are to be taken out while a set of rolls will be provided.——David Kennedy, owner of the Brazil mine at Freeland, has started development. The lower adit is to be driven ahead as a small streak of high-grade ore is exposed.——Machine drills are to be brought into use at the Hoosac adit, situated on lower Fall river. E. T. Quigley of Denver has been appointed manager.——A 240-ton shipment of ore recently made from the Refugee mine to the Hudson mill resulted in a clean-up of 107 oz. gold from the plates, as well as 30 tons of concentrate that brought $1200.

Idaho Springs, July 10.

GILPIN COUNTY

(Special Correspondence).—Large development is in progress at the Baxter mine on Quartz hill. Operations are being centered on the 100 and 200-ft. levels, shipments of both mill and smelting ore being maintained.——Development is in progress on the Ashtabula property situated in the Nevada district. A new shaft-house is in course of construction, while a 50-hp. boiler and a 25-hp. hoist has been purchased. W. T. Wells is manager.——Work was resumed on the Rockford mine in Russell district. Lowe & Harris, the owners, state that the shaft will be sunk another 100 ft. ——The south vein of the Gunnell mine has been intersected by the Newhouse tunnel.——Heavy shipments have been in order during the past two weeks by Shearer & Co., who are leasing on the Old Town mine. The product is sent to the Golden pyritic smelter, but no settlement has yet been effected.

Central City, July 12.

LAKE COUNTY

Chloride ore in considerable quantity has been opened at the Anona property on Long and Derry hill by H. B. Collins and Tony Hurn, the drifts have been started in the hope of opening a continuous orebody.——A company composed of Denver capitalists has secured a bond on the Fourth of July claims in Big Evans gulch and will sink a shaft to prospect the ore.——Work has been resumed by George F. Champion on the Little Bob property and the adjoining Volunteer will be prospected from the bottom of the Little Bob shaft.——St. Louis interests have secured a lease on the north 750 ft. of the Fanny Rawlings, and the shaft is being unwatered and retimbered.——Stoping is in progress on both sides of the Highland Mary shaft and 30 tons of ore per day is being shipped to the smelter.——Local operators have secured a lease on the President claim and started cleaning up the property.

OURAY COUNTY

Joseph H. Tumbach, manager for the Colorado Smelter Co., has taken possession of the pyritic smelter north of Ouray, and it is reported that the plant will resume operations. This will mean much for the properties of that district as it is only possible for a number of them to run when local treatment can be obtained.——The Guadalupe at Ironton has been put in shape for active mining, and shipping will be resumed in a short time. There is considerable high-grade copper-silver ore blocked out in the mine.——Arrangements have been completed for the resumption of work at the Micky Breen in the Poughkeepsie district.

TELLER COUNTY

An 8-ft. vein assaying from $40 to $50 per ton has been opened on the 800-ft. level of the Golden Cycle Mining Co. on the Legal Tender claim. The company is now installing a 30-drill Ingersoll-Rand compressor.——The Modoc Mining & Milling Co. is continuing development and shipping considerable ore from the old Frakenburg vein. Plans are now in preparation for the installation of a mill patterned after the Portland plant.——John Kilday is shipping ore that assays about $30 per ton and screenings that go as high as $275 from his lease on the sixth level of the Blue Bird mine.——Ore assaying $40 per ton was opened within 10 ft. of the surface on the Last Dollar claim by sub-lessees.——The Roosevelt Deep Drainage Tunnel was advanced 373 ft. during June, leaving 570 ft. still to reach the El Paso shaft. ——The new machinery is being installed as rapidly as

GEORGIA

[illegible] COUNTY

Lee Von Rosenberg [illegible] Columbia Mining Co. [illegible] A large amount of [illegible] small parcel [illegible] land thus [illegible] been discovered [illegible] company's mill [illegible] or worked [illegible] size of shaft [illegible] management of the Hercules [illegible] district will [illegible] manager. [illegible] mine and the [illegible] 150 feet.

IDAHO

BLAINE COUNTY

In the Wood River district the Nay Aug Idaho Mines Co., of which W. W. Clancy of Portland is manager, has succeeded to the ownership of the Nay Aug mine, having purchased the interest of the Wood River Zinc Co. in the property. The Nay Aug is an old mine, having been operated in the eighties. It is situated on Deer creek, ten miles from a railroad siding between Hailey and Ketchum. The principal vein is in granite and the latest development has been from No. 7 adit level on the vein. This adit has served for transportation and drainage. It gives 700 ft. depth, and the plan is to extend it 300 ft. farther. A raise will be made 250 ft. from this adit level to connect with a shaft. It is also intended to sink a winze from the adit. The orebody in the vein is from 10 in. to 2 ft. wide, the ore assaying 50% lead, 65 oz. silver, and 0.3 oz. gold. The company is spending $35,000 on development and equipment, the latter including a hydro-electric power-plant, situated one and one-half miles from the mine on Deer creek; also a hoist, air compressor, and air drills. W. S. Haskins was recently engaged as superintendent, and is now in charge. The company has five patented claims.——The Croesus mine and mill, three miles west of Hailey, belonging to the Croesus Gold & Copper Mining Co., and under the management of S. E. Rigg, is shipping five carloads per month of first grade ore and concentrate.

IDAHO COUNTY

The Elk Mines Corporation is to install a boiler to supply power for the 5-stamp mill at the South Fork mine in the Elk City district, and thoroughly overhaul the plant. The adit at the Cumberland is now in 50 ft. and is expected to cut the vein within the next 20 ft. The company is to install a power plant and a machine drill.——George H. Jennings, who is developing the Hope claims two miles east of Elk City under lease and bond, is opening ore in the bottom of the shaft that assays about $50 per ton.

SHOSHONE COUNTY

The Bullion Mining Co. will begin shipping from its mine, between St. Regis and Wallace, early in September, according to James H. Taylor, secretary and treasurer of the company, now in Spokane. He also announced that a 5-drill air compressor will be installed at that time and that it is purposed to add a small mill early next spring. The company is to install jigs to concentrate the ore already taken out. The main shaft is down 180 ft., or 50 ft. below the main adit level, with which it is connected. The workings on that level have opened two shoots of chalcopyrite ore.——John Winkle, president of the Idora Mining Co. and B. F. and S. E. Knudtson of Spokane, will begin work on the O. K. property in the St. Regis district early in August. August Paulsen of Spokane, one of the owners of the Hercules mine in the Coeur d'Alene district, has undertaken to finance the Puritan mine in the same neighborhood, and the property will be opened at once.

KANSAS

CHEROKEE COUNTY

[illegible] The Central camp is busier [illegible] than it has been for several years. [illegible] the most prominent recent developments are those [illegible] the Gilbert land. On the land Mr. Savage and associates [illegible] opened one of the best deposits found in years. One [illegible] sold to $9 opens a 20-ft. deposit of lead ore. At a [illegible] distance a second shaft is down 90 ft., the ore face in [illegible] being 30 ft. high. In this the ore is zinc and assays from 20 to 25%. The ore is being treated at the old Bonanza mill, which has been leased by the company.——To the west of this land the Rotchaugh brothers have opened a zinc run at 60 ft. which is proving freer in character than that found in the Savage shaft. Four drill holes have been sunk, two of which cut rich ore.——The recent heavy rains caused Short creek to overflow and the shafts and drifts on the Lockport land were flooded to the surface. All workings below 20 ft. had to be suspended and the pumps have been heavily taxed to overcome the water. A new centrifugal pump together with an Emerson and two walking-beam pumps will all be used.——The large plant of the Diplomat company is almost completed and will be run by electricity. The mill was formerly the Lizzie D. moved from the Peacock district. There are at least 4000 tons of unsorted ore to be treated by the mill.

Galena, July 9.

MICHIGAN

The directors of the Osceola Consolidated Mining Co. have declared a semi-annual dividend of $4 per share. The dividend declared six months ago was $6 and and a year ago $4. Osceola dividend is payable July 28 to stock of record July 5. The declaration of $4 per share calls for the distribution of $396,000 and makes a total of $8,980,650 paid in dividends since the organization of the company. The following is a dividend record of the company since its organization:

Year	Rate	Amount	Year	Rate	Amount
1878	$1.00	$ 40,000	1895	$ 2.00	$ 100,000
1879	1.50	60,000	1896	2.50	125,000
1880	4.50	240,000	1897	3.00	191,000
1881	4.50	225,000	1898	3.00	277,250
1882	4.00	200,000	1899	6.00	558,450
1883	3.00	150,000	1900	6.00	571,200
1884	1.75	87,500	1901	6.00	576,900
1887	1.00	50,000	1904	2.00	192,300
1888	3.00	150,000	1905	4.00	385,600
1889	1.00	50,000	1906	10.00	961,500
1890	4.50	225,000	1907	13.00	1,249,950
1891	3.00	150,000	1908	2.00	192,300
1892	3.00	150,000	1909	8.00	769,200
1893	2.00	100,000	1910	10.00	973,509

NEVADA

CLARK COUNTY

The Homestead Mining & Milling Co. has given up its option on the Duplex ground and the property has reverted to the original owner, G. Fred Colton. Operations will be resumed on the ground by Mr. Colton and a large amount of development carried forward before any attempt at stoping is made. Over $300,000 worth of ore has been taken from the mine at various times.——Smith & Fessler who hold a lease on the I.X.L. ground recently ran 15 tons through the Knight mill from which they obtained a 41 oz. bar of gold.——The Square Deal Mining Co. is to install a new hoist and will commence sinking within the next few months. J. F. Booth is superintendent.——A 50-ton mill is to be installed at the Nevada Eagle mine in Eldorado canyon. The return on a lot of test ore shipped recently amounted to $23 per ton, the ore showing no complex features. The plant will be only for amalgamation and concentration.——The concrete foundation for the Independence mill has been completed and the stamps will be installed at once.

CHURCHILL COUNTY

A number of properties in the Wonder district have added

to their working forces since the ground for the Nevada Wonder mill has been broken.——Notices of a special meeting of the stockholders of the North Star and the reorganized Alice Mining Co. to be held in Goldfield July 18 have been sent out, and these companies will elect new directorates and arrange for further exploration on the properties.

ESMERALDA COUNTY

The 100 stamps of the Consolidated mill at Goldfield are now dropping for the first time since the fire several months ago and the output from the plant should be increased about 20%.——The Combination Fraction Mining Co. has ordered a new tube-mill, classifiers, and other equipment for the plant of the Nevada Goldfield Reduction Co. and is treating 70 tons of ore per day.——The Morrison lease on Daisy ground is producing about six tons per day of $25 ore.——It is reported that the Goldfield Belmont will resume work on its property in the Diamondfield district on company account. The owners are keeping the water out of the Burke lease workings and the operations of the lessees in this portion of the mine have led the company to believe that a continuation of the shoot may be opened farther on.

LANDER COUNTY

The adit of the Pittsburg-Red Top in the Kimberly district opened the vein when in approximately 600 ft. showing it to have a width of 12 ft. Between 7 and 8 ft. of the ore is a concentrating material, the balance, smelting. The property is owned by the Kimberly Consoldated Mines Co. ——L. G. Sands who has a bond on the Grey Eagle has driven the drift 200 ft. on the vein and is opening a body of smelting ore.——A body of $15 ore is being opened on the Fuller & Mason group which is being worked under bond.

LINCOLN COUNTY

Fred Falkner, receiver for the Bamberger Delamar Mines Co. has sent out notices that the property of the company will be sold at public auction at Caliente September 13. The outfit to be sold consists of electrical equipment, hoists, air-compressors, and other machinery.——The Consolidated Pioche Mining Co. has retimbered the portions of the shaft that were in need of repair and is sinking from the 1200-ft. level.——The mining situation in the Pioche district has improved materially since the re-establishment of the railroad service, and a number of the properties are shipping ore and concentrate. Teams are hauling ore from the Mendha mine to the depot, and a carload of Mendha ore with a car of concentrate from the Poorman lease were forwarded to Salt Lake.——George Coxe, manager of the Golden Prince, has returned and is preparing to sink to the 700-ft. level.

NYE COUNTY

(Special Correspondence).—Development on the 1000, 1108, and 1166-ft. levels of the Belmont have exposed from 10 to 20 ft. of ore said to average $10 per ton. The east drift on the 1108-ft. level is about 40 ft. south of the new Belmont shaft and has opened 12 ft. of ore for over 300 ft. A carload of ore per day is being shipped in addition to the amount handled by the mill.——The MacNamara management has decided to install a diamond-drill on the 800-ft. level and explore the property to a depth of 1000 ft. below this. A large body of low-grade ore has been opened at this point.——The shaft of the Mizpah Extension has been repaired and sinking is progressing from the 800-ft. point. It is planned to drive south cross-cuts as soon as the shaft has attained the 1000-ft. level.——Machinery for the new mill of the Tonopah Liberty mine is arriving. T. S. Carrahan, general manager, reports good ore opened at several points.——The bullion return of the Round Mountain Mining Co. for June is $28,000 which is a little below the average. This is due to the fact that the company handled a large amount of low-grade ore preparatory to the installation of new machinery and development. The new plant is being hauled to the mine and will be installed within the next two weeks, when the ore from the eastern portion of the property will supply the material for the mill.

Tonopah, July 10.

WHITE PINE COUNTY

The station at the 1200-ft. level of the Alpha shaft of the Giroux Consolidated in the Ely district has been reinforced with concrete and when the pumps are installed cross-cutting to the east will be started. The station is 125 ft. long and 25 ft. wide, and the pumps will have a combined capacity of 1800 gal. per minute.——At the Nevada Consolidated everything is ready for the opening of the Liberty steam-shovel pit west of the present workings on Copper Flat. Two steam-shovels and three locomotives will constitute the initial equipment, the track for which is now being laid.——Four feet of copper ore has been opened in a winze from the adit on the North Star claim of the Ely Calumet which is leased to F. A. Strelhke. ——The main shaft of the Ely Central will be down 550 ft. in a few days and drifts will be started to explore the ground that adjoins the Nevada Consolidated.——There are 200 tons of ore on the dump of the Kinsley Consolidated that will be forwarded at an early date to Salt Lake.——Work has been started at the property of the Bowen-Ely Gold Mines Co. and the vein will be opened in several places. W. N. Bowen is manager.——Johnson & Hastie, who have been operating the Sun & Moon claims under lease and bond for the past few months, have recently shipped a carload of silver-lead ore that is expected to net $30 per ton. ——Salt Lake interests have secured a bond on the claims of Thomas G. Watkins in the Blackhorse district for $37,000 and the deeds to ground have been placed in escrow in Salt Lake.——The Ohuana Mining Co., which owns a group of claims near Osceola, has completed plans for a 20-stamp mill and ground for the new structure will be broken within the next two months.——A raise in the main workings of the Minnesota Lead Co. on Duck creek opened a body of galena ore and teams have been started hauling the product to the McGill siding from which point it will be forwarded to Salt Lake.

NEW MEXICO

SIERRA COUNTY

(Special Correspondence).—Schiele, Chapman, and associates of Colorado Springs have exercised their option upon the Ivanhoe property in the Black range, and the first payment has been made, Kansas City interests providing the financial backing. It is understood that active operations will begin soon, with Mr. Chapman in charge at the mine. This property has the deepest shaft in the district, and the ore is chiefly bornite.——A large force of men is making rapid progress in the reconstruction of the old Phillipsburg mill. Portions of the old machinery, available for use with the new process, are retained and new machinery necessary to complete the plant will be installed. The operating company is the Black Range Reduction Co., which purchased the old mill and mill-site, and which owns considerable mining property in the district. In addition to treating its own ores, the company expects to do custom work, for which there is a distinct field here. The camp has many immense deposits of milling ore which can be made to yield a profit under local treatment, but which do not justify shipping under existing conditions of transportation. It is understood that the Black Range Reduction Co. will be prepared to receive ore within 90 days.——Recent sampling of the workings at the 200-ft. level of the U. S. Treasury mine shows general conditions to be much better than they were at the 100-ft. level. It is understood that the sampling shows a general average of close to $22 per ton. The company is concentrating its work in the opening and blocking out a large tonnage in anticipation of the early erection of its own treatment plant.——The Silver Monument operators, after a long and practically barren line of development, have struck some fine ore, the first high grade they have found since beginning their long adit. It contains chalcopyrite, bornite, and native silver.

Chloride, July 11.

GRANT COUNTY

It is expected that the Chino Copper Co. will have its new mill plant, now in course of construction, completed

within a year. [illegible] and [illegible] ties are being made at the [illegible] of the Santa Fe railroad. It is [illegible] at the present time and it [illegible] Holson's ranch for [illegible] water.

A considerable tonnage of [illegible] gold ore is being added to the reserve of this mine each month. There is a large amount of ore on the property proved up at this time and it is learned that at least 10% of this tonnage can be mined by steam shovels. Some stripping of the steam shovel territory has been started and by the time the mill is in operation there will be ample ore exposed to feed the plant for a number of years to come. The initial capacity of the mill is to be 2500 tons per day, but it is understood that this capacity may be increased within a short time after the plant is started.

UTAH

BEAVER COUNTY

The Arrowhead Mining Co. in the Arrowhead district is driving its lower adit to open the shoots found near the surface and preparing the upper levels for a large production.——The King of the Hills mill is now turning out concentrate that assays 42% lead, 10% copper, and 10 oz. silver per ton.——The Cupric Mines Co. which owns 16 claims four miles northwest of the Horn Silver mine is working about a dozen men on the 600-ft. level and driving on the ore. The shaft is sunk on the contact between granite and a limestone and has cut a number of pockets of rich copper ore.——The Horn Silver is shipping from 1000 to 1500 tons of ore per month and working about 75 men. A small pocket of ore was opened a short time ago on the 700-ft. level that assayed from 300 to 800 oz. silver per ton.

JUAB COUNTY

At a recent meeting of the board of directors of the Mammoth Mining Co., an assessment of 10c. per share was levied.——The Chief Consolidated is raising above the 1400-ft. level on ore that assays 200 oz. silver per ton. The report of the general manager to the home office at Houghton states that a profit of approximately $41 per ton was made on an 11-car shipment, and that the company earned a profit of $20,000 for the month of June.——Work at the Eagle & Blue Bell is centered on the main shaft which is down over 275 ft. No effort is being made to crowd production but from 16 to 18 carloads of high-grade ore per month is being shipped.

SUMMIT COUNTY

The zinc plant at the Grasselli is proving more of a success every day by sending out increased shipments of zinc concentrate. The Daly Judge and Daly West are both shipping considerable zinc, that material now proving an asset to the properties rather than a drawback as it has been considered in the past.——At a meeting of the directors of the First National Mining Co. recently it was reported that the adit is in 150 ft. and is expected to open the fissure within the next 150. The cash from the last assessment is all in and there is a surplus in the treasury that should be sufficient to drive the present workings to their limits.——Shipments of high-grade ore from Park City during the month of June amounted to 7893 tons. Daly West leads the list with nearly 3000 tons, while Daly Judge is a close second, with Silver King in third place. June shipments were as follows:

	Tons
Charles Moore	171
Frank Hamer	18
Daly-Judge	2,200
Chris Anderson	128
Little Bell	360
Grasselli Chemical Co.	946
Daly West Mining Co.	2,738
Daly Mining Co.	34
Silver King Mining Co.	1,219
Total	7,893

YAVAPAI COUNTY

The Mayer dredge on Groom Creek [illegible] of Vernal is working on [illegible] between [illegible] and [illegible] per cu. yd. [illegible] Eastern [illegible] prospected a company to take over the Arnold and McHughs placer claims.——Two oil strikes west of Vernal [illegible] are indications of oil and a rig has been shipped to that district to drill a number of holes on a royalty basis.

CANADA

BRITISH COLUMBIA

(Special Correspondence.) The Copper Creek Mining Co. for which M. K. Rodgers of Seattle is manager, is estimated to have 1,000,000 tons of ore exposed by 2000 ft. of open-cut work and a 1,000-ft. adit. The ore is said to assay 3 to 3½% copper, carrying an excess of iron. It is a self-fluxing sulphide ore. A 2000-ft. gravity tramway and a one-mile electric car line over which the ore is to be transported to the water front on Portland canal are partly constructed. Mr. Rodgers thinks the company is practically

Copper Creek Mine, Portland Canal District.

ready for a smelting plant.——The Engineer's group at Atlin has a vein of gold-bearing ore, some of which assayed $5000 per ton. The larger part of it is of milling grade and the owners of the property have installed a 10-stamp mill for crushing, amalgamating, and concentrating. The fact that there is an abundant water supply in Atlin district makes it certain that the hydraulic placer mine operators will have a full season's run and profitable clean ups.——A syndicate has been organized at Vancouver to purchase the Ikeda copper mines, situated on Morsby Island, 500 miles from Vancouver. This property is generally known as the Japanese mines. Ore shipped brought about $60,000. The main vein has been opened and considerably developed by an adit level that gives a depth of 300 ft. A second vein, parallel to the first one, has also been opened. The ore consists of chalcopyrite, much of which assays unusually high in copper. The syndicate which contemplates taking over the property is made up of S. J. Castleman, W. H. Armstrong, Mr. McClellan, and associates. Andrew G. Larson, consulting engineer for the syndicate, recently examined the property.

Vancouver, July 11.

ONTARIO

The fifth shipment of ore from the Beaver mine in southeastern Coleman has been forwarded to Carnegie, the average assay being 116 oz. silver per ton. There was 30 tons in the lot, which brought the total for the year to 90 tons. The ore was drawn from the stopes on the 250-ft. level of the winze.

YUKON TERRITORY

Greenough Brothers, of Spokane, who have taken over the Pueblo group of copper mines at White Horse, are to begin the shipment of 200 tons of ore per day to the Tacoma smelter about August 1. The ore is said to carry 3 to 4% copper, accompanied by a high percentage of hematite. A railroad track from White Horse to the mines has been finished.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

OWNERSHIP OF SURFACE AND MINERALS

It is a well settled principle of mining law that one person may own the surface and another the minerals in the same land. It is also the rule that title to the freehold of either the surface or minerals thereunder cannot be acquired by adverse possession of the other.

Morrison *v.* American Assn. (Va.) 65 S. E. 469, Sept. '09.

INJURY TO MINER—NEGLIGENCE

In an action by a miner for damages for an injury where it appeared that props for the roof of a mine allowed a clearance of not more than three or four inches for the cars ordinarily used, this was sufficient to warrant an inference of negligence.

Golden *v.* Mt. Jessup Coal Co., (Pa.) 73 Atl. 1103, June '09.

LEASE OF COAL—RECOVERY OF RENTALS

A lease of coal for ninety-nine years stipulated that the lessee should pay a stated minimum royalty, but neither the lessee nor his assignee ever took possession of the coal under the lease or performed any of its covenants. In an action by an assignee of the lessee to recover the coal in a suit in ejectment, the Supreme Court of Montana decided that he could not recover without paying the minimum royalties then in arrears.

Cornely *v.* Zentmyer, (Pa.) 73 Atl. 967, May '09.

INJURY TO MINER—FELLOW SERVANTS

A mine-boss and a fire-boss employed in a coal mine, pursuant to the statute of West Virginia and in the performance of the duties thereby imposed upon them, including the duty of the mine-boss to see that as the working places advanced 'break-throughs' for air are made, or that 'brattice' shall be used, were held to be fellow servants with a miner employed in such mine, and that the owner and operator of the mine was not liable for injuries sustained by the miner on account of the negligent performance of such duties by the mine-boss.

Bralley *v.* Tidewater Coal & Coke Co., (W. Va.) 56 Southeast. 684, Jan. '09.

CONSTRUCTION OF GAS LEASE—CANCELATION AND FORFEITURE

An oil and gas lease gave to the lessee the exclusive right to produce oil and gas from a certain tract of land. The lease provided that if a well was not drilled upon the premises within one year, the lessee's right should cease. The lessors were to have gas for domestic use, if found in quantities sufficient to justify the expense of marketing, and were to be paid $50 per year during the time gas should be marketed from each producing well. One well was completed within the year. The lessors were given sufficient gas therefrom for domestic use, and the lessee also used it for fuel in drilling; but no other use was made of the well, no gas was sold; no other wells were drilled, and the lessors never received anything except the one dollar, the consideration in the lease, and such gas for domestic use. Several other gas wells were drilled on adjacent lands by the lessee and by other parties, some of which yielded gas sufficient for marketing. More than four years after this well was completed the lessor served notice of forfeiture and commenced an action to cancel the lease. On the trial of the case it was held that the lease contemplated that the well should be operated and gas marketed therefrom in a reasonable time, and that other wells should be drilled and operated with reasonable diligence to utilize the lease; that four years' delay under the circumstances was unreasonable; that the lessors had no adequate remedy in damages and were entitled to have the lease forfeited and canceled.

Howerton *v.* Kansas Natural Gas Co., (Kans.) 106 Pac. 47, Jan. '10.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

GEORGE J. YOUNG is at San Francisco.

E. B. KIRBY is at Los Angeles, California.

J. H. RODGERS, of Seattle, has gone to Alaska.

E. E. ELLIS is at Evanston, Illinois, temporarily.

E. F. BURCHARD is at Glennwood Springs, Colorado.

CHARLES KIRCHHOFF is enjoying a vacation in the Tyrolese Alps.

LEWIS T. WRIGHT has returned to San Francisco from London.

JON UDDEN is with the T. C. I. & R. Co., at Birmingham, Alabama.

W. S. NOYES is making a short visit to Sierra county, California.

THOMAS A. JAGGAR, JR., is in Costa Rica studying earthquake phenomena.

P. C. STOESS, mining engineer, of Seattle, Washington, was at Denver last week.

CYRUS ROBINSON sailed from New York for Europe, July 13, on professional business.

V. V. CLARK has opened an office at Seattle to engage in mining engineering practice.

EDMUND JUESSEN has established headquarters in the Sheldon building, San Francisco.

OLIVER B. FINN has been examining dredging ground on Burnt river, in eastern Oregon.

STANLEY C. HEROLD, of Tonopah, Nevada, was at the Palace Hotel, San Francisco, last week.

C. K. LEITH has gone to Rio de Janeiro, by way of London. He will return about October 15.

EDGAR D. STONE has changed his address from Box 462, Atlanta, Georgia, to 63 Park Row, New York City.

STANLEY C. SEARS has been appointed general manager for the Mexico Con. M. & S. Co., Parral, Chihuahua, Mexico.

PHILIP N. MOORE will be in central Idaho soon and probably will visit San Francisco before returning to St. Louis.

J. J. WELCH, superintendent for the Mason Valley Mines Co., has returned to Mason, Nevada, after ten weeks' vacation.

SAMUEL S. ARENTZ, general superintendent for the Nevada Douglas Copper Co., and the Nevada Copper Belt railway is at Los Angeles.

ARTHUR K. ADAMS has resumed his position as Mineral Inspector in the General Land Office, making his headquarters at Cheyenne, Wyoming.

DYKE V. KEEDY and CARL F. DIETZ, of the firm of Dietz & Keedy, metallurgical engineers, of Boston, have gone to Virginia to make professional examinations.

CHARLES W. WRIGHT, consulting engineer for the Societa di Pertusola mines in Sardinia, has returned to Washington for the summer to complete some work on the Geological Survey.

FRANK BAIRD, metallurgist at the Penn Chemical Works, Calaveras county, California, has accepted a position with the Pacific Foundry Co., of San Francisco. DONALD SMITH succeeds him as metallurgist at the Penn Chemical Works.

E. B. STURGIS, for a number of years engaged in mining examination work, is now associated with the J. R. Alsing Engineering Co., manufacturers of grinding, crushing, and pulverizing machinery. The new office of this concern is at 90 West street, New York City.

R. B. LAMB, mining engineer, of New York City, has concluded examinations at Argenta and York, Montana, and the Ohio Keating mine at Radersburg, Montana, for the Radersburg Con. M. Co. Mr. Lamb is now at Eldorado, California, making an examination of the Manhattan-California G. M. Co.'s property for the Radersburg Con. He will return to New York the end of July.

Book Reviews

[illegible]

HANDBOOK OF COST DATA. By H. P. Gillette. Second Ed. Pp. 1854, ill., index. Pocket leather binding. M. C. Clark Pub. Co., Chicago, 1910. Price $5.

The fact that a second edition of this work is demanded sufficiently indicates its usefulness. In preparing the new volume Mr. Gillette has included so much additional material that the work has been expanded nearly four fold. The result is that a vast amount of miscellaneous cost data has been included and where all such material must be intelligently applied in order to be useful the author has done what he could by classification and selection to safeguard mistakes. The book is one that will be welcomed by all contractors and construction engineers.

WHO'S WHO IN MINING AND METALLURGY, 1910. Pp. 290. *The Mining Journal*, London, 1910. Price $4.50.

This work includes 147 pages devoted to individual biographies, 123 devoted to a directory of engineering societies, and 15 to a list, with address, of makers of mining supplies. The directory of societies is much the most complete feature of the work. The individual biographies, while concise and useful, are by no means as numerous as the importance of mining justifies. We sincerely hope that patronage may be sufficient to warrant rapid expansion of succeeding editions of the work, since a really comprehensive 'Who's Who' would be vastly useful. However, the present book is much the best directory available, and the publishers deserve great credit for their enterprise in furnishing it to the profession.

ORE MINING METHODS. By Walter R. Crane. Pp. 219, ill., index. John Wiley & Sons, New York, 1910. Price $3.

There has long been a need for a book such as this in which the methods of mining ore were described and discussed. General text books of mining cover too wide a range to give the detail so much needed. In the past it has been necessary for each engineer confronted by a new problem to travel and see or to search laboriously through the scattered periodical literature on the subject. This will still be the best way, but with Mr. Crane's book at hand he will have a guide. A wide range of mining methods are described almost entirely from first hand knowledge and the illustrations are fresh and new. We wish that the descriptions had been made somewhat more detailed, and we are sure it would have been helpful had references to special articles been included. The chapters, while brief, are almost always clear and are conveniently summarized. The book will form a welcome addition to the library of every engineer in charge of underground work.

The Prospector

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

T. N. S., Ameca, Mexico: Serpentine.

F. A. L., Glenns Ferry, Idaho: Calamine.

H. S., Halifax, Nova Scotia: A, granite; B, hornblende schist.

J. H. P., Golconda, Nevada: A, micaceous schist too badly decomposed to determine origin; G, silicious limestone.

J. C. S., Danville, Washington: No. 14a, gabbro; No. 17, serpentine; No. 18, hornblende schist; No. 19, gabbro with chalcopyrite; No. 20, magnetite; No. 21, silicified slate.

A. S. C., Ocotlan, Mexico: No. 1, fine grained metamorphosed silicious rock, probably rhyolite; No. 2, dolomitic limestone; No. 3, andesite tuff; No. 4, andesite tuff; No. 5, rhyolite; No. 6, andesite; No. 7, andesite.

Recent Publications

EARTHQUAKES: THEIR CAUSES AND EFFECTS. By Edmund Otis Hovey. Reprint Pam. Am. Philos. Soc. Vol. 48, No. 192. Pp. 235-268. Philadelphia, 1909. This is an excellent editorial summary with specific accounts of a number of the great shocks written by the accomplished secretary of the Geological Society of America.

WET AND DRY DIFFERENTIATION OF IGNEOUS ROCKS. By A. C. Lane. Tufts College Studies, Vol. III, No. 1. Pp. 29-74. May, 1910. This is an interesting comparison between the results obtained by Arthur Day and his associates in the investigations of the melting of rocks, with field observations at Mount Johnson, Quebec.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF MINING ENGINEERS, Vol. 40. Pp. 946, ill., index. New York, 1910. This volume contains the papers and discussions of 1909, and while they are already familiar through the Bulletin, they are here presented in revised form. The volume marks a useful rather than notable year in the activities of the Institute, and in particular the volume is much better balanced than have been some of the predecessors. The Institute covers mining in its widest sense, and in volume 40 many phases are treated in a significant manner.

THE WEST VIRGINIA GEOLOGICAL SURVEY has just issued two new publications; a new and revised edition of its Coal, Oil, Gas, and Limestone Map, and a detailed report with accompanying topographic, geologic, and soil maps, covering the counties of Pleasants, Wood, and Ritchie. A full description of these publications and how to secure them is given below:

1. NEW EDITION OF THE COAL, OIL, GAS, AND LIMESTONE MAP. This new edition contains a thorough revision of the coal, oil, and gas development, being brought up to date as nearly as possible. The new railway lines constructed since the last edition was published, August 31, 1908, have also been added. The names and post office addresses of all the coal companies operating in West Virginia up to the early part of 1910 are given on the map by counties, and the mines are indicated by appropriate symbols and numbers. The extension of the great Burning Springs Anticlinal southward from the Little Kanawha river through Wirt and Roane counties is correctly indicated on this map for the first time from field studies made by Ray V. Hennen during 1909 and 1910, and its extension northward to the Ohio river, is also given from the detailed studies of G. P. Grimsley during 1908 and 1909. Scale, 7 miles to the inch. Price, enclosed in strong envelope and delivered by mail, 50c. each.

2. NEW DETAILED COUNTY REPORT, ON PLEASANTS, WOOD, AND RITCHIE COUNTIES, with a case of topographic, geologic, and soil maps, assembled from the accurate topographic sheets of the U. S. Geological Survey into single large maps embracing the entire area of the three counties. The text of this Report, containing 352 pages + XIV, gives interesting descriptions of each county, its history, industries, mineral resources, soils, etc., as well as many detailed records of oil and gas borings. The soils of the district have been studied, mapped, and described by the experts of the Bureau of Soils of the U. S. Department of Agriculture. The topographic and geologic maps show all the roads, by roads, houses, school houses, churches, villages, streams, etc., and also the elevations above tide all over the areas of the three counties. The oil and gas pools developed up to 1909 are also shown by appropriate symbols. Price of volume and case of maps, postage or express prepaid, $1.75.

Teachers and public libraries get a discount of 40% from the prices quoted on this circular, but they pay the delivery charges, either express or postage.

Application should be made to I. C. White, State Geologist, Morgantown, West Virginia. A complete list of publications with special discount rates for combinations will be sent on request.

GOLDFIELD CONSOLIDATED FOR JUNE

The preliminary report for the month of June, by J. R. Finlay, general manager, is now available, and from it the following abstract has been prepared.

TONNAGE PRODUCED

	Wet tons.	Dry tons.	Av. oz. per ton.
Combination	4,936	4,715	1.14
Mohawk	6,927	6,617	1.46
Red Top	3,777	3,608	1.99
Clermont	5,393	5,151	4.23
Total	21,033	20,091	2.19

The gross amounts to be credited to the various mines are as follows:

Combination	$111,085
Mohawk	199,701
Red Top	148,397
Clermont	450,297
Total	$909,480

The performance of the mill was as follows:

Dry tons milled	20,091
Average value per ton	$45.27
Total value	$909,480
Loss in tailing	$41,216
Value realized	$868,264
Percentage extracted	95.47

		Amount.	Av. per ton.
General:			
Bullion tax and marketing bullion		$19,000	
Administration, etc.		18,000	
		$37,000	$1.84
Mining		80,000	3.98
Transportation		2,800	0.14
Milling:			
Milling and cyaniding	$50,000		
Marketing concentrate residue	5,000		
		55,000	2.74
Construction and fire loss		65,000	3.23
Cost		$239,800	$11.93
Loss in tailing		41,216	2.05
Total costs and losses		$281,016	$13.98
Profit per ton		$31.29	
Total value of ore		$45.27	
Total profit for month		$628,464	
Percentage of profit		69.10	

The extraction by the mill was unusually good. In this connection it is to be noted that in the tailing-losses there are included this month more than 300 oz. of gold in concentrate residue. This residue has heretofore been shipped to smelters and the entire amount of concentrate included in the saving reported. But this month more than half the concentrate residue was too low grade to cover freight and treatment charges, so that it was piled on the dump and the gold content included with the other tailing.

At the mill the essential parts are completed for running at full capacity, but some further work in the way of changes made necessary by the fire and mere finishing touches will continue for some time. The Columbia Mountain fire protection scheme, the storage battery plant, a new assay office, a new engineering building, new transformer houses, and a new head-frame and ore-bins for the Laguna shaft are designed and under way. All this construction is fire-proof and the intention is either to secure economy in operating or to protect vital parts of the plant from fire. During April, May, and June the constant expenses have been written off more rapidly than the money has actually been expended. All construction now in sight will be completed by October, and for the remaining months of the fiscal year the costs on this account will be comparatively small.

DEVELOPMENT

During the month the total advance was 2861 ft., equal to one foot for every seven tons mined. The work was distributed among the various mines as follows:

	Feet.
Combination	367
Mohawk	914
Clermont	1,212
Red Top	294
Laguna shaft	74
Total	2,861

Ore was taken from main levels as follows:

	Tons.	Av. oz.
Mohawk:		
350-ft. level	111	0.53
450-ft. level	165	0.50
Clermont:		
600-ft. level	565	1.15
750-ft. level	182	0.95
900-ft. level	161	0.37
	1,184	0.86

BUTTE PRODUCTION IN JUNE

For June, the first month under the completed Anaconda merger operations, the Butte mines produced 26,317,200 lb., against 28,363,760 in May. It is not certain that the reduction is the result of a policy of intentional curtailment; officers of the Anaconda company say not. Both the Anaconda and Great Falls smelters are operated to capacity, but they are not able to treat all the ore that has been shipped to them since the Anaconda company took over the Clark copper mines, which yield about 500 tons of ore per day. The reduction about represents the ore that was formerly mined in excess of the capacity of the two smelters, no more ore being shipped to the old Clark smelter. The average daily ore tonnage, the average yield per ton in copper, and the daily production in June were about as follows:

Company.	Daily, tons.	Lb. of copper per ton.	Daily copper output.
Boston & Montana	3,650	70	255,500
Anaconda	4,120	62	255,440
Butte & Boston	530	64	33,920
Washoe	400	62	24,800
Parrot	150	66	9,900
Trenton	390	62	24,180
North Butte	1,050	68	71,400
Butte Coalition	1,400	70	98,000
Butte-Ballaklava	110	180	19,800
Tuolumne	150	110	16,500
East Butte	320	90	28,800
Original	500	70	35,000
Miscellaneous	50	80	4,000
Totals	12,820		877,240

The month's totals were:

Company.	Tons of ore.	Lb. of copper.
Boston & Montana	109,500	7,665,000
Anaconda	123,600	7,663,200
Butte & Boston	15,900	1,017,600
Washoe	12,000	744,000
Parrot	4,500	297,000
Trenton	11,700	725,400
North Butte	31,500	2,142,000
Butte Coalition	42,000	2,940,000
Butte-Ballaklava	3,300	594,000
Tuolumne	4,500	595,000
East Butte	9,600	864,000
Original	15,000	1,050,000
Miscellaneous	1,500	120,000
Totals	384,600	26,317,200

JUNE COPPER PRODUCTION

The figures of the Copper Producers Association for June [illegible] some encouragement. The production and imports of the metal in June [illegible] to 127,219,188 pounds; domestic deliveries [illegible] to 53,362,196 pounds; exports [illegible] to 65,895,948 pounds; total supplies [illegible] to 168,386,017 lb. The [illegible] was increased to just 100,000 against 15,441,874 lb. May [illegible] on the right side of 19,481,270 lb. at the close.

Upon these figures L. Vogelstein & Co. comment as follows under date of June 8: "The statistics for the month of June show an increase in stocks of 7,000,044 lb. For the same month the stocks of copper in English and French warehouses decreased 6,828,000, showing a net decrease in the warehouse stocks of copper for the month of 13,828,044 lb. For the first six months of the year the stocks of copper in European warehouses have decreased to 75,500 tons; stocks in the hands of American producers have increased 26,120,000, showing a net increase of stocks of copper all over the world of 9,564,000 pounds.

It has to be borne in mind however that during the same period the invisible supplies of copper have materially decreased both here and abroad, partly on account of consumers pursuing a policy of buying from hand to mouth and partly on account of European dealers having reduced their stocks of copper in various European ports. During the past six months production increased 35,873,941 lb., domestic deliveries 74,662,736 lb., and exports decreased 32,907,909 pounds.

We are of the opinion that at the present moment and for the last six months, in spite of the enormous production, consumption all over the world has been in excess of production. The maximum of the producing capacity of this country has been reached for the time being, and no further material increase may be looked for during the next six or nine months, while there is every likelihood that consumption, at least in this country, will do better than it has done in the months of May and June. In our opinion the slightest revival of demand is bound to produce higher prices, while enlarging exports at the lower range of values now prevailing, furnish renewed evidence of the willingness of Europe to buy copper when cheap."

American statistics of copper production and consumption in the first six months of 1909 and 1910 may be summarized as below, in pounds of copper.

	Production and imports	Domestic deliveries	Exports.	Surplus.
1910				
January ...	116,547,287	78,158,387	81,691,672	98,463,339
February	112,712,493	66,618,322	37,369,518	107,187,992
March	120,067,467	62,844,818	40,585,767	123,824,874
April	117,477,639	67,985,951	31,332,403	141,984,159
May	118,356,146	61,163,325	70,542,753	169,848,141
June	127,219,188	53,362,196	65,895,948	168,386,017
Totals ...	717,266,550	388,274,896	302,370,748	
1909.				
January ...	112,135,200	51,862,624	38,499,797	144,130,045
February ..	103,700,817	43,578,118	30,968,496	173,284,248
March	117,058,661	48,871,964	59,191,043	182,279,902
April	113,574,292	47,546,010	65,110,111	183,198,073
May	118,356,146	61,163,325	70,542,753	169,848,141
June	116,567,493	60,591,116	70,966,457	154,858,061
Totals ...	681,392,609	313,613,157	335,078,657	

THE BULLY HILL property of California made in June the following production: 550,000 lb. of copper, 30,000 oz. of silver, 750 oz. of gold. At present about 50 tons of ore are being shipped daily from the Copper City mine to the First National Co.'s smelter for treatment. This ore averages approximately 6½%, which means that the company is producing, roughly, 180,000 lb. of copper per month. When the smelter shut down on June 30, instead of laying off the men, they were given the opportunity of going to work at the mines which will be kept operating.

Market Reports

[illegible] METAL [illegible]

San Francisco, July 14

Antimony	12 -12½c	Quicksilver flask	[illegible]
Electrolytic Copper	14½ -15c	Spelter	[illegible]
Pig Lead	4.50 -4.60c	Tin	[illegible]

METAL PRICES

[illegible] from New York

Average daily prices [illegible] per pound

Date	Copper	Lead	Spelter
July 7	12.25	4.20	[illegible]
" 8	12.25	4.20	[illegible]
" 9	12.25	4.20	[illegible]
" 10	Sunday	No market	
" 11	12.19	4.20	[illegible]
" 12	12.07	4.20	[illegible]
" 13	12.07	4.20	[illegible]

ANGLO-AMERICAN SHARES

Cabled from London

	July 7. £ s. d	July 11. £ s. d	
Camp Bird	1 8 1	1 7 6	
El Oro	1 9 9	1 8 6	
Esperanza	2 15 0	2 12 0	ex div
Dolores	1 7 6	1 5 0	
Oroville Dredging	0 6 0	0 8 0	
Mexico Mines	9 6 0	9 2 6	
Tomboy	0 17 0	0 16 6	

(By courtesy of W. P. Bonbright & Co., 71 Broad St., N. Y.)

COPPER SHARES - BOSTON

	Closing prices July 14.		Closing prices July 14.
Adventure	6	Mohawk	42
Allouez	31½	North Butte	22
Atlantic	5¼	Old Dominion	33
Calumet & Arizona	66	Osceola	118
Calumet & Hecla	510	Parrot	12½
Centennial	13¾	Santa Fe	1⅝
Copper Range	60⅜	Shannon	9¼
Daly West	7	Superior & Pittsburg	20¼
Franklin	9⅝	Tamarack	46
Granby	28	Trinity	41¼
Greene-Cananea, ctf	64¼	Utah Con	20
Isle Royale	16	Victoria	2½
La Salle	9	Winona	5
Mass Copper	8½	Wolverine	102

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS - NEW YORK

(By wire from Catlin & Powell Co., New York.)

	Closing prices July 13.		Closing prices July 13.
Amalgamated Copper	57½	Miami Copper	17⅝
A. S. & R. Co	68	Mines Co. of America	5⅛
Boston Copper	17⅜	Montgomery-Shoshone	⅛
B. C. Copper Co.	5	Nevada Con	17¼
Butte Coalition	17⅛	Nevada Utah	⅞
Chino	10⅝	Nipissing	10¾
Davis Daly	⅞	Ohio Copper	1⅛
Dolores	6	Ray Central	2⅜
El Rayo	3¾	Ray Con	16⅛
Ely Central	¼	South Utah	1¼
First National	3	Superior & Pittsburg	9¾
Giroux	6¼	Tenn. Copper	20¼
Guanajuato Con	1	Trinity	5⅛
Inspiration	7	Tuolumne Copper	2⅜
Kerr Lake	8⅛	United Copper	11¼
La Rose	4	Utah Copper	41⅛
Mason Valley	6⅞	Yukon Gold	4

SOUTHERN NEVADA STOCKS

San Francisco, July 14.

Atlanta	$ 11	Mayflower	$ 3
Belmont	3.80	Midway	25
Booth	13	Montana Tonopah	96
Columbia Mtn	6	Nevada Hills	2 40
Combination Fraction	51	Pittsburg Silver Peak	85
Daisy	5	Rawhide Coalition	15
Fairview Eagle	40	Rawhide Queen	25
Florence	2.10	Round Mountain	47
Goldfield Con	8.90	Sandstorm	4
Gold Kewenas	5	Silver Pick	7
Great Bend	3	St. Ives	13
Jim Butler	26	Tonopah Extension	75
Jumbo Extension	25	Tonopah of Nevada	8 50
MacNamara	32	West End	56

(By courtesy of San Francisco Stock Exchange.)

BALATA BELTING

Announcement is made that a combination of German and American capital has been brought together for the building of a great Balata belting factory in the United States. Though large quantities of Balata belting are in service for transmission purposes in the United States at the present time, not one foot is manufactured in America. The corporation behind the new enterprise is known as the Victor-Balata & Textile Belting Co. The American interests represented in the new company are Charles E. Aaron and John R. Stein, president and treasurer, respectively, of the New York Leather Belting Co. of New York. The German interests are represented in the new company by William Vollrath, Albert Vollrath, and Edwin Vollrath, of the firm of C. Vollrath & Sohn, of Blankenburgh, Germany. The officers of the new combine are Charles E. Aaron of New York, president; Edwin Vollrath of Blankenburgh, Germany, secretary; and John R. Stein of New York, treasurer. The building of the new plant will entail an expenditure of half a million dollars in buildings and equipment. It will be located at Easton, Pennsylvania. Work on the first two buildings of the new plant will be begun immediately. A 1000-ft. siding is being built by the Lehigh Valley railroad from its main tracks to the factory site. Two buildings to be erected at once include the main factory building, 150 by 100 ft., and an impregnation building, 75 by 60 ft. Both will be constructed of concrete and structural steel to render them absolutely fire-proof. An interesting feature connected with the new plant is that a complete miniature village will be erected on the site to house the workmen of the plant. All the dwellings will be of concrete. A great weaving plant for the weaving of cotton duck will be an added feature as soon as machinery is built. The advent of a plant for the manufacture of Balata belting in the United States brings out many interesting features relative to the manufacture of this type of belting. One of the most interesting is the extreme secrecy which has always guarded the various plants where this belt has been manufactured abroad. The new company expects to begin installing its machinery in September and be in full operation late in October. When the chain of buildings is completed the plant will be the largest textile belting factory in the world.

MULLEN BLACK SAND SEPARATOR

Many attempts have been made to concentrate and save the heavy minerals associated with black sand in placers. This is in line with one of the best efforts of modern industry, to effect closer saving and complete utilization of by-products. C. M. Mullen, now of 1112 East Washington street, Portland, Oregon, but long connected with mining in Colorado, has recently patented a device for removing black sand from the bottom of sluices by means of a movable apron fixed in an extension of the sluice, operated by rack and pinion, and so arranged as to skim from the bottom of the stream a thickness fixed at will. The sand is then diverted to a cross-sluice and further concentrated or shipped direct as needed. The device is simple, cheap, and should be effective in certain situations. It is proposed to operate through a company leasing tailing rights wherever hydraulic mining is under way. Mr. Mullen in this enterprise is associated with I. B. Hammond.

The Penberthy Injector Co. of Dertoit, recently shipped injector number 600,000. That the above company has since 1887 made this number of their automatic injectors, gives some idea of the large horse-power of the boilers which must be in operation at the present time. It has been estimated that 600,000 GG Penberthy injectors would force into a boiler against 90 or 100-lb. pressure, over one-sixth of the amount of water that is constantly going over Niagara Falls; approximately 125,000,000 to 150,000,000 gallons per minute. This when transformed to steam at 70-lb. pressure is sufficient to develop power amounting to approximately 700,748,661 hp., or very near five times the estimated horse-power of the world's steam machinery.

COMMERCIAL PARAGRAPHS

L. S. Pierce, Denver, has moved his office and demonstration plant to 1738 Broadway.

The Samson Mfg. Co., Denver, has moved its office from 1650 Champa street to 1738 Broadway.

Falkenburg & Laucks, of Seattle, have added ore-testing facilities to their chemical laboratory.

The Elspass Engineering & Mining Machinery Co., Denver, has moved its office to 1738 Broadway.

The Redwood Manufacturers Co. announces that Fred H. Flood is now in charge of its cyanide plant equipment department. All cyanide and leaching equipment business will receive his personal attention.

The Mining Exploration Co., with offices at 71 Broadway, New York, advise that they wish for their files, catalogues from manufacturers of machinery used in the mining and reduction of gold and silver ores.

The Redwood Manufacturers Co. advises, among other sales, cyanide plants for the George H. Roth Mining Co., Boise, Idaho; Inspiration Copper Co., Miami, Arizona; Wasp No. 2 Mining Co., Deadwood, South Dakota.

The Pacific Foundry Co., San Francisco, announces that it has secured the services of Frank Baird as a member of its metallurgical staff. Mr. Baird has until now been metallurgist at the Penn Chemical Works, Calaveras county, California.

The Mine & Smelter Supply Co., New York City, announces that it has taken over the agency for the entire Western territory of the United States of the line of pumps made by the Epping-Carpenter Co., Pittsburg, and the compressors made by the Bury Compressor Co., Erie, Pennsylvania.

Arrangements have been made by the C. W. Hunt Co., New York, builders of coal handling, conveying, and hoisting machinery, by which their business on the Pacific Coast will be handled by the San Francisco Bridge Co., with offices at 865 Monadnock building, San Francisco. The company has just completed a Naval Coaling Station in San Francisco Bay for the Government.

Walter Ives, for the past nine years connected with the staff of *The Engineering and Mining Journal*, and Edward B. Sturgis, a mining engineer of many years' experience, have affiliated themselves with the J. R. Alsing Engineering Co., manufacturers of crushing, grinding, and pulverizing machinery. They have largely increased their engineering force; obtained better manufacturing facilities; and made many other improvements. They are moving to larger and more commodious offices, at 90 West street, New York City. The J. R. Alsing Co. claims to be the pioneer manufacturer of tube-mills in the United States, having been building them for 42 years. Mr. Ives is at present on an extended European trip in the interest of his new firm.

CATALOGUES RECEIVED

Allis-Chalmers Co., Milwaukee, Wis. Bulletin No. 1070. 'Barometric Condensers'. Illustrated. 12 pages. 8 by 10½ inches. Bulletin No. 1071, 'Jet Condensers'. Illustrated. 16 pages. 8 by 10½ inches.

Mulconroy Co., Inc., 723 Arch street, Philadelphia. Catalogue No. 22. Showing metallic hose, rubber hose, and leather-soled rubber boots and shoes. Illustrated. 24 pages. 6 by 9 inches.

Pennsylvania Flexible Metallic Tubing Co., Philadelphia. Booklet, 'Metal Hose'. Illustrated. 22 pages. 3½ by 6 inches. The Western business of this company is handled by the U. S. Flexible Metallic Tubing Co., Los Angeles, San Francisco, Houston, St. Louis, and Seattle.

Harron, Rickard & McCone, San Francisco and Los Angeles. Catalogue No. 2. Fourth Edition. 'Supplies for Mine and Mill, Machine Shop, Power Plants, and Contractors'. This is one of the most complete and best arranged supply catalogues that has come to our attention in some time. A comprehensive index and system of code words is included. The publishers will be glad to send a copy to any one interested. Illustrated. 172 pages. 9 by 12 inches.

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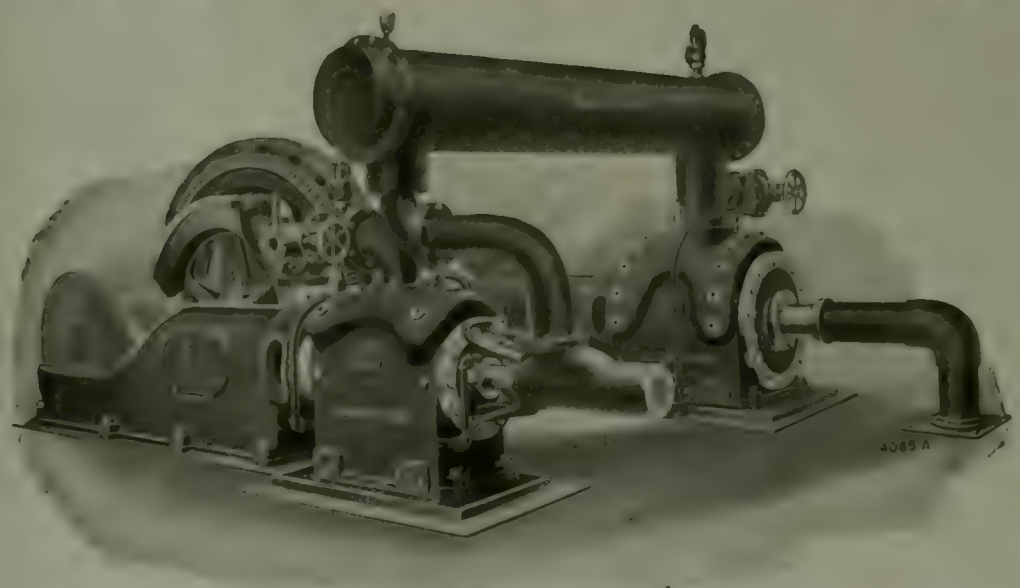

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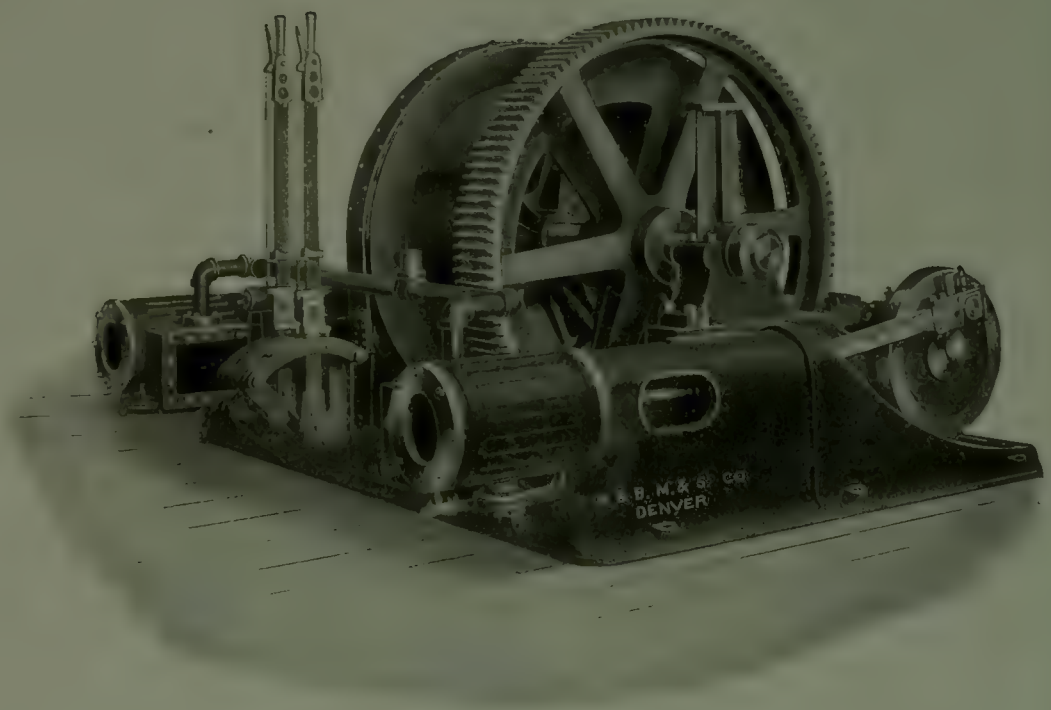

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EDITORIAL

PLANS for the work of the Bureau of Mines for the current year have been approved by the Secretary of the Interior and are detailed on another page.

PEAT has never been used in America to any great extent. Both in the United States and in Canada there are great areas covered by peat bogs, that contain much potential power and wealth. The American Peat Society, which will meet at Ottawa, Canada, July 25, 26, and 27 has already done much to stimulate interest in the possibilities of peat utilization.

ANNOUNCEMENT in San Francisco papers of the sale of the Western Fuel Company to British investors proves to have been premature. An option has been given and a sale may result but the matter is still undecided. The Western Fuel Company has been a remarkably successful concern. It was formed by consolidation of a number of independent coal-selling companies at the time that competition by oil had reduced the San Francisco coal business to a no-profit basis. By controlling mines, transportation, and market facilities, the company has succeeded in not only holding its own against the new fuel, but has grown and prospered.

DISCOVERY of high-grade gold ore in a deserted silver mine, made T. F. Walsh wealthy and started the great Camp Bird mine producing its millions. A similar discovery has just been made in the Iowa-Tiger, another San Juan, Colorado, property. In this case the mine had not been abandoned but from its lofty position above Silver lake has been shipping lead-silver ore nearly as steadily as its more famous neighbor. Recently occasional high returns in gold caused a search of the mine, and a high-grade streak of ore was found on the hanging wall. Since it differs greatly from the other ore of the mine it had passed unnoticed. The full value of the find is yet uncertain, but we may at least wish that it prove equal to that in the Camp Bird.

LABOR troubles at Butte are feared by the miners. Since Butte is the last great stronghold of the Western Federation of Miners, that bellicose organization will doubtless use every effort to win in case of trouble. Consolidation of ownership at Butte takes away the power that the men have long had of playing one interest against the other, and the defeats that the Federation has sustained in other districts cut off a large amount of outside support that has previously by being available, like the

modern battleship, prevented war. It is hard to see how the Anaconda company can long avoid curtailment of output and anything that causes the discharge of men is likely to precipitate trouble.

PLATINUM is one of the metals of which there seems no danger of over production. The ratio of supply to demand is measured by price, which now stands at approximately $30 per ounce. In other words platinum is at present much more valuable than gold. A number of rare metals are associated with platinum as it occurs in nature. Among these are palladium, iridium, osmium, rhodium, and others. The known uses for most of these are few and prices are more or less arbitrary. In general, however, they sell, when refined, at prices even higher than that of platinum. Alloys of platinum with them are known as 'hard metal' and sell at an advance price. At the same time, owing to the difficulties in refining and the small amount of business transacted, refiners generally make a deduction when buying platinum ores containing any of these metals. America has not produced large quantities of any of these metals though they are known to be widely distributed and to be found frequently in the black sands of placer workings. The Oroville dredging fields yield a small but steady supply. Ore at the Rambler mine in Wyoming has been known for some years to carry small amounts of platinum but concentrate recently made has been found to contain several ounces to the ton of that metal accompanied by notable amounts of the others. It now seems likely that a really important American supply of these metals has been found.

Southern Gold Mining

The general mining laws have never been applied to lands in the Southern States except Arkansas and, to a limited extent, Louisiana. In the others the lands have been either privately or State owned and when, as in Alabama, public lands were present, they have been treated as entirely agricultural by virtue of special congressional enactments. Gold has been mined in a number of the States, but in the last half century the superior attractions of the West, with the disorganization of industry due to the Civil War, has prevented the normal growth of the industry. One of the most interesting attempts to re-establish gold mining in the South is now being made by the Columbia Mining Company owning a large tract in McDuffie county, Georgia. This company proposes to open the whole area to prospectors. Men may stake out claims 1500 by 600 feet in size, and, in event of discovery being made, will be given free all ore to a depth of 100 feet. Beyond that they may have a lease on the ground with a bond for its purchase if desired. Ore may be treated in the company mill or separately as desired. Work must be done under direction of the resident engineer and, while extra-lateral rights apparently are not to be recognized, there seems to be no limit to the number of claims that may be taken by each man, provided the work be done in good faith. The plan has some of the features of the Western public land law and also resembles the Joplin leasing system. In that it opens large areas to active prospecting and provides for real work on the claims, it is good. How it works will, obviously, depend on the success of the first prospectors in finding ore and the attitude of the company in interpreting the contract. If the rules of interpretation adopted by the courts in cases under the United States mining law be followed, nothing more can be asked.

The recent record of Southern gold mines has not been such as to inspire confidence. The ores are admittedly low grade and in part refractory. The land has been the picnic ground of the process man and the stock of the companies operating there has been the football of the New York curb. Yet gold in large quantity has actually been won in the southern Appalachians and much more undoubtedly exists. It is not a region attractive to poor prospectors working alone, and large companies have generally scored a failure. It remains to be seen whether a combination of the two can not solve the difficulties.

Lake View and Oil Prices

The phenomenal and diabolical production of the Lakeview gusher continues. It has ceased to be a novelty, but its output is so tremendous and its effect on the oil industry so demoralizing that it cannot be forgotten. When the well first came in, it was looked upon with favor by most oil men. It would call the attention of the world to California oil, and show how lavish with her mineral wealth Mother Nature had been to us. The well was expected to flow for a few hours or days, until all eyes had been attracted and would then accommodatingly sand up until its production was needed. The Lakeview had no such intention. Its program has never varied, except in degree, from day to day. It has produced in a steady torrential stream. Its daily output has been more than the total daily production of any other field except Coalinga. It has entirely changed the outlook of the industry. The stupendous production calls for greatly increased storage and transportation facilities. Add to this the uncertainty as to the length of time the gusher will continue, and there is sufficient cause for the present slump in oil.

The present depression will probably continue only until transportation facilities can meet the production. Were the Lakeview to cease flowing within the next fortnight, it is probable that equilibrium would soon be restored, at least temporarily. It is significant that the output of the Lakeview very nearly equals the present overproduction. It must be borne in mind, however, that there will be more large wells in the Midway district, and there is always a chance of another Lakeview upsetting the market. The latest cut in prices to the consumer will doubtless help to extend the consumption in California. There has been no decided lowering of prices to the producer, but no long-term contracts are being drawn by the marketing companies, and the members of the Independent Oil Producers Agency, in their present co-operative arrangement with the Union, are receiving only a little more than

one half what they got from the Associated last year. It is to be hoped that the present slump will have the effect of calling public attention to the many illegitimate and overcapitalized concerns whose unscrupulous promoters have been preying upon uninformed investors. It is also to be hoped that it will have a tendency to check the recent feverish and wasteful activity of development. Already a curtailment of development can be noted, but there are enough wells even now being drilled in what is probably gusher territory to keep the production above the consumption for some time to come.

The unusually high pressure of gas encountered in all the wells drilled to a sufficient depth in the Buena Vista hills promises another inducement to great manufacturing industries on the Pacific coast. There is little reason to doubt that pipe-lines will be extended to San Francisco bay as soon as it is demonstrated that a sufficient quantity of gas exists. At present the gas in the wells of the Standard and the Honolulu Consolidated is considered more of a menace than otherwise, and is a great source of trouble in drilling for oil.

Meeting of the Chemists

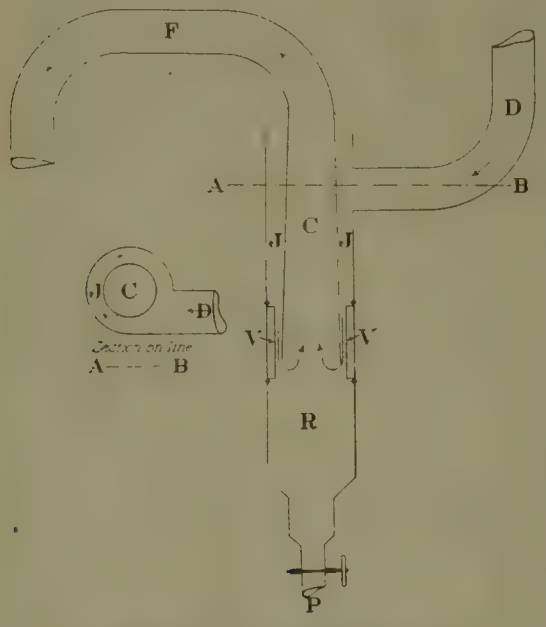
The American Chemical Society, which has just closed a highly successful meeting in San Francisco, is at once one of the most prosperous, as it is useful, of the great scientific societies. With some 5000 members scattered throughout the United States, Canada, and other countries, and including men pursuing all branches of the science, the Society is a great union of both practical and scientific workers. It has become so large that its work is organized in sections by subjects, and its membership in branches arranged geographically. The annual sessions bring together men from all parts of the country and with various points of view. The papers read are sure to be scholarly and the discussions important. At the San Francisco meeting one session of the section of Industrial and Engineering Chemistry was devoted to a symposium on smelter-smoke problems. Papers by Charles Baskerville, W. C. Ebaugh, and F. G. Cottrell were read, followed by a general discussion. The whole will be published in full in one of the journals of the society, for this organization not only meets in sections but also publishes in sections: three distinct journals being supported. Mr. Cottrell's paper attracted the largest amount of attention. He illustrated by lantern slides the various steps taken in the development of the electric precipitation process, and later, at the Selby smelter, where the chemists were guests at luncheon Friday, showed the process in operation on a working scale. So successful has it proved that a much larger installation is now being made to clear the smoke at the Coram plant of the Balaklala Consolidated Copper Company, and thus again the scientific chemist, coming in touch with the practical problems of the mining industry, has given service.

The meeting of the Society calls to mind, at once, both the antiquity of the science and the marvelous developments that in recent years have been made by it. The science of chemistry dates back to the commencement of the Christian era and is supposed to have originated in Egypt. The art of metallurgy, which today so blends with chemistry that it is often difficult to find the line of demarcation between the two, is of even older origin, some of its processes being mentioned in the Old Testament. Though the description is clouded, perhaps, by Biblical poesy, there can be little doubt that Jeremiah had in mind the refining of silver by cupellation when he wrote: "The bellows are burned, the lead is consumed of the fire, the founder melteth in vain: for the wicked are not plucked away. Reprobate silver men shall call them, because the Lord hath rejected them." The science soon abandoned the effort to turn base metals into gold, and yet today we seem to be nearer to the transmutation of metals than ever before. It is not, however, the avaricious transmutation of the alchemist, nor is it the work of man, but rather the watching and understanding of A Wonderful Nature doing her own transmutation.

From the work of Ramsay, Rutherford, and Soddy, supported by an army of able experimenters, we learn that uranium slowly but surely transmutes itself into ionium, then into radium, which, in its turn, is degraded into other substances. So it is with thorium and other radioactive substances, and there appears to be every reason to suppose that all the elements are slowly undergoing transmutation, but the change is so infinitely slow that in the paltry length of our lives, in the cases of the more stable metals, we are unable to detect it. Still it is one of the triumphs of modern chemistry that changes which are taking place with such infinite slowness can not only be observed, but actually timed and measured and weighed. The ingenuity of the chemist, who has devised apparatus for doing this, is truly wonderful. It is no ordinary chemistry, with its flasks and beakers, and burned and stained fingers, that accomplishes these minute measurements and weighings. Imagine rather a balance made entirely of fused quartz, the beam of which weighs less than half a gram, and hanging from one end of the beam a fused quartz bulb containing a known quantity of air, while suspended from the other end of the beam the substance to be weighed. Imagine the counterpoising of this balance being made, not by the addition of familiar weights, but by the alteration of the air-pressure within the fused-quartz bulb. Then stretch your imagination once more and think of the movement of the indicating needle—a quartz fibre—being read by the aid of a powerful microscope. For measuring liquids and gases, picture the clinical thermometer, over which the doctor strains his eyes when taking his patient's temperature, and recognize that this is much too coarse an apparatus and that the tube has to be drawn out, to reduce its size, before it is possible to measure the emenation thrown off by the metal radium. Such are some of the instruments the chemist of today is using in his researches in radioactivity and transmutation. What new marvels will be discovered time alone can tell.

Dust Extraction From Smelter Smoke

The problem of precipitation of dust from smelter smoke has engaged the attention of metallurgists for many decades, and it still offers opportunity to trained investigators. The staff of the Copper Queen Consolidated M. Co. at Douglas, Arizona, under the direction of G. B. Lee, the smelter superintendent, has been conducting a series of experiments for the purpose of determining the conditions under which the solid matter in the smoke may be precipitated and recovered. The details of this study will soon be available in a paper to be published in the Bulletin of the American Institute of Mining Engineers. The effect of temperature, expansion of volume, velocity of the gases, and the like, have been carefully inves-



Dust Extraction at Calumet & Arizona Smelter.

tigated, and an enormous amount of data accumulated. The experimental plant in which these observations were conducted consists of a 6-in. pipe running up the side of the stack, and turned by elbows so as to take the gases from the centre, an exhaust being so applied to this pipe as to secure an accurate sample, leading the fume away at the same velocity as that at which it rises in the stack. Chambers provided with means for observation of temperature, pressure, etc., receive the gases below. These lead to an experimental bag-house. The immediate result of the work done at this plant has been a decision to enlarge the existing dust-chamber. At the Copper Queen smelter the dust-chamber depends upon volume rather than length for efficiency, and is not provided with baffle-walls, nor with means to increase friction by extension of the surface-area in contact with the gases. The flue opens directly into a wide high chamber, which becomes narrower by successive steps toward a short flue leading to the stack. Thus the advantage accruing from the chamber is that due to expansion. The chambers are merely being enlarged in their horizontal dimensions.

The amount of dust mechanically carried into the atmosphere through the stack of the Copper Queen smelter is large, and its recovery is entirely an economic measure. The precipitation of the sulphuric anhydride does not enter into the problem, as there is no contest with the farmers at this point. The agriculturists at Douglas seem to be as content to have the smelters in their midst as are the farmers of New Jersey, who abide in peace with their metallurgic neighbors. In fact the situation at Douglas is unique. The diurnal variation in temperature is normally great, and at certain seasons the change is so severe as to prove fatal to agriculture. The smoke from the smelters, however, spreads a gaseous mantle over the valley which opposes the radiation of the heat absorbed by the earth during the day, thus rendering possible the utilization of a considerable area for raising a large variety of crops which formerly could not be grown at all.

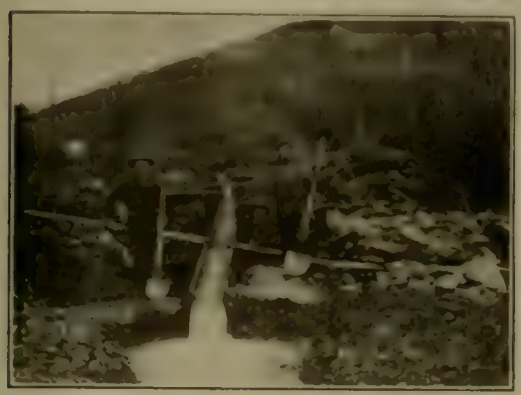
The Calumet & Arizona smelter, situated near the Copper Queen, on the outskirts of Douglas, has also taken in hand the problem of recovery of the fine dust which fails to settle in the dust-chambers. It must be said that at neither smelter has the provision for arrest of dust been as elaborate as that at the majority of large smelters, and the temperature of the gases in the stack is relatively high, owing to the short travel from the furnaces and to the small dilution with air. The Calumet & Arizona is just installing an experimental apparatus for dust-recovery, the elements of which are shown in the accompanying sketch in plan and vertical section. The gases are led to the apparatus through the flue D, which connects eccentrically with the settling cylinder R. Within this cylinder, which is 12 ft. diam., is another cylinder set concentrically, expanding from a diameter of 6 ft. at the top to 8 at the bottom. This produces an annular chamber J J. When the gases enter this on one side they are given a rotary motion as they sweep around the inner cylinder R. On passing below the open mouth of the inner cylinder C they come into an expanded area, and thus their velocity will be checked. The reduction of velocity is aided by the opposition of a series of vanes, V V, projecting 1 ft. inward from the shell of the outer cylinder R. The dust that falls will be drawn into bins through the valve P, while the gases will issue through C to the flue F. A similar dust extractor was applied to the gases issuing from an iron blast-furnace in the East, and is said to have given good results. The new appliance will soon be in operation at Douglas, under the direction of James Wood, the smelter superintendent. The plans were drawn by A. J. McDermott, assistant superintendent, and James A. Potter, civil and mechanical engineer to the company.

During the month of June the U. S. Geological Survey reported the classification of 1,244,501 acres of coal land and 1,306,655 acres of non-coal land. The sale price of the coal land was fixed at $80,605,666. The minimum price fixed by law for the same land is $14,300,923.

Mining at Shungnak, Alaska

By Lewis Lacey

In the year 1898, when the Alaska gold excitement was at its highest, there appeared a luring advertisement at San Francisco of the fabulous finds of the Kobuk river country on the Arctic slope, where gold was found 'as large as hickory nuts' and that the officers of the revenue cutter *Bear* were staking or working natives to take out these hickory nuts of gold. This advertisement brought over 2000 men from their homes in all kinds of crafts to reap the



Sluicing on Dahl Creek.

golden harvest that they supposed awaited them. They camped along the banks of the Kobuk river and its tributaries, disappointed and disgusted, until the spring of 1899, when they left Kotzebue sound. But a few remained, myself included.

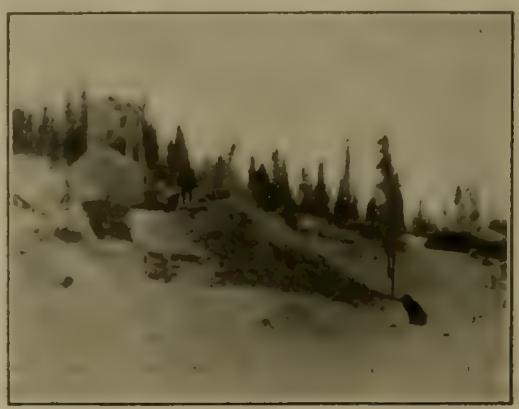
The miners at Shungnak have been rather quiet

Home-Made Car, Wheels Bushed With Tomato Cans, at Shungnak Copper Mine.

about what is doing, but it should be remembered that development on mines here is all done with money taken from the mines themselves, that all provisions are brought in, and that all the Eskimo laborers receive $3 to $4 per day and board, in the working season. This speaks well for the mineral resources, and if staying with it is all that is needed, this district will come to the front in the near future. The placers have paid every expense of the few whites and the Eskimos. Dahl creek is the chief source of production. Placer mining is resumed on that creek, Ruby creek and the Shungnak river, and many nuggets are taken out, the largest thus far, valued at $6.63. Placer gold is not the only thing found here. Great copper deposits have been discovered and at present two good copper prospects are being developed. The Ruby Creek copper mine has a steam hoist and a frame set up; the shaft is down 65 ft. The orebody is 300 ft. wide. The Aurora copper mine has completed a 100 ft. adit which will tap a large body of ore at a depth of 160 ft. Twenty claims are included in the Aurora mountain group on which the ore outcrops for two

Ruby Creek Copper Mine.

miles. The ore is bornite and chalcopyrite, assays showing the bornite to contain 58.41% copper, and $1.72 silver and gold. The chalcopyrite assayed copper 28.44% with a trace of gold and silver, while some ore from the Ruby Creek mine ran, copper 11.71%, gold and silver $1.84. Samples from the Sunny Side



Hoist and Boiler in Tent at Ruby Creek Copper Mine, Shungnak.

group assayed, copper 9.81%, lead 27.73%, gold and silver $2.55; and the Midnight Sun group assayed, copper 5.59%, lead 13.56%, gold and silver $1.24. All these are from surface prospects. Coal also occurs in the district. Following is a list of the minerals that I have determined thus far: asbestos, coal, jade, kaolin, and talc, also gold, galena, pyrite, pyrrhotite, zinkite, tetrahedrite, sphalerite, bornite, chalcopyrite, and copper carbonate, in quartz. Since its discovery ore has been shipped yearly.

Bureau of Mines Plans

The acting director of the Bureau of Mines, George Otis Smith, has announced the following plans for the work of the present season.

The act establishing a Bureau of Mines in the Department of the Interior, approved May 16, 1910, became effective July 1. As originally approved, the law contemplated the transfer of the entire Technologic Branch of the United States Geological Survey, the mine accident investigations, fuel investigations, structural materials investigations, including the entire personnel, property, and equipment, to the Buerau of Mines. The Sundry Civil appropriation act, approved June 25, however, amended the law to such an extent that the structural materials investigations, including the personnel and equipment for these investigations, went to the Bureau of Standards, Department of Commerce and Labor. The Secretary of the Interior has therefore transferred to the Bureau of Mines the investigation of mine accidents and fuels, together with the personnel and equipment of these investigations, and to the Bureau of Standards the structural materials investigations and the employees of the Technologic Branch of the Survey engaged thereon. The fully equipped Testing Station at Pittsburg goes to the Bureau of Mines. The Bureau of Mines therefore includes the mine accidents and fuel investigations for which an appropriation of $410,000 was made by Congress. The total appropriations for the Bureau, including salaries, rent, and expenses of removal amount to $502,200.

The work of the Bureau of Mines for the first year will be a continuation and expansion of the work carried on by the Technologic Branch of the Geological Survey. The law in itself provides for a variety of other problems that properly belong to the Bureau of Mines and which should eventually be undertaken, such as methods of mining and metallurgical processes, but these activities will be deferred for the most part until Congress gives adequate appropriations. The spirit of the debates in Congress both on the Bureau of Mines legislation and on the appropriation items emphasized the desire to regard the mine accidents investigations as urgent, and this will be the feature of the work. In all, $310,000 was appropriated for mine accident investigations. Of this sum, under the general plans approved by the Secretary of the Interior, $120,000 is to be spent on the rescue stations, $36,000 for housing nine stations, $34,000 for equipping eight new stations, and $10,000 for additional equipment for five existing stations. The allotment for the investigation of explosives is $40,000; for electricity in mining, $14,000; appliances for preventing mine accidents, $8000; examination and codification of mining laws, $5000; and other technologic investigations, ore treatment, etc., $10,000. For the analyzing and testing of the coals, lignites, ores, and other mineral fuel substances belonging to or for the use of the United States, $100,000 was appropriated. Of this amount, $35,000 will be spent in the chemical and physical investigation of fuels, $25,000 in the inspection of government fuel purchase, $22,000 in fuel efficiency investigations, $5000 in lignite and peat investigations, and $4000 in briquetting investigations. The mine accident investigations, which have been transferred from the Geologcal Survey to the Bureau of Mines, were first authorized in the legislative appropriation act of May 22, 1908, carrying for this purpose an appropriation of $150,000. This was followed by a similar appropriation carried in the act for the sundry civil expenses of the government for 1910. A mine experiment station was established in Pittsburg during 1908, at which, since that time, investigations of explosives, coal gas, dust, electricity, and other possible causes of mine explosions have been continually under way. The mining engineering field force of the Geological Survey has already made decided progress in the study of underground mining conditions and methods. Practically all of the coal mines in which mine explosions have occurred during the last two years have been carefully examined, the gases, coke, and dust have been analyzed at the laboratory at Pittsburg and every effort has been made to determine the explosibility of various mixtures of gas and air in the presence of shots of different types of explosives. Considerable progress has also been made in the investigation of explosives used in coal mining and the conditions under which they may be used with least risk. Manufacturers have submitted many explosives for test at the station, and a considerable portion of them passed and have been classified among the permissible explosives. Investigations in connection with the use of mine rescue equipment have proved useful and will be continued. The inspection of fuel purchased by the Government will also be continued.

The publications of the Survey relating to mine and fuel investigations, those prepared by the Technologic Branch, will in the future be distributed by the Bureau of Mines. The publications relating to structural materials will continue to be distributed by the Geological Survey. The last of the bulletins of the Technologic Branch to be published by the Survey will be issued from the Government Printing Office about August 1. This bulletin relates to the Explosibility of Coal Dust and was prepared by G. S. Rice, with chapters by J. C. Frazer, Axel Larsen, Frank Haas, and Carl Scholz. The first of the Bureau of Mines bulletins, the Volatile Matter of Coal, by H. C. Porter and F. K. Ovitz, will be published in the next few months. Then will follow Coal Analyses, by N. W. Lord and J. S. Burrows; Final Data Regarding Steam Tests, by L. P. Breckenridge; North Dakota Lignite as a Boiler Fuel, by D. T. Randall and Henry Kreisinger; Producer-Gas Tests in 1905 to 1907, by R. H. Fernald; The Coke Industry as Related to the Foundry, by Richard Moldenke; Coals for Illuminating Gas, by A. H. White and Perry Barker; and Petroleum for Combustion under Steam Boilers, by I. C. Allen. These publications, when issued, can be obtained by addressing the Director of the Bureau of Mines, Washington, D. C.

Economics of Secondary Enrichment—II

BY A. M. EDELMAN

(Continued from Page 110)

Copper Ore deposits of copper owing to remarkable interchangeability and proneness to alteration of the different sulphides furnish by secondary alteration and enrichment the most striking examples among the metals of the economic significance of these processes. The great importance of secondary copper ores is widely recognized. Of the oxidized ores azurite was mined extensively at Bisbee and Clifton, chalcanthite at Copiapo, Chile, and at Reno Blue stone mine, in Nevada. Chrysocolla was an important ore in Arizona and Texas and malachite in the Urals. Of the sulphides chalcocite has supplied most of the copper at Butte, at Rio Tinto, and in Nevada and Arizona. Secondary chalcocite ore has been estimated to supply most of the United States copper output at the present day. Covellite was abundant in the Gray Rock mine, at Butte, secondary enargite in Colorado and Chile, bornite in Chile and at Mount Lyell. Secondary enrichment pulled Mount Lyell through a critical epoch in its history and transformed the upper portion of Mount Morgan into a gold mine. The rich secondary ores of the Anglesea and Wicklow pyrite deposits once enabled the British mines to dominate the copper market of the world, and with the exhaustion of these rich ores, most of the old British copper mines ceased to produce. Recent work by American geologists on the relations of the copper ores has shattered some illusions and prepared the way for a clear understanding of the principles of alteration.[10]

The occurrence of primary enargite at Butte is a case in point. The existence of lean cupriferous pyrite, in which the copper is primarily combined with the pyrite, has been suggested by some writers, but James F. Simpson has shown that at Butte the copper occurs as definite minerals (enargite and chalcopyrite) enclosed in the pyrite. Similarly, at Rio Tinto, lean ore examined microscopically by myself shows in every case minute grains of chalcopyrite, with or without alteration products, embedded in the pyrite.

The respective alteration zones of copper deposits are generally fairly well marked. The normal order is leached and impoverished gossan, zone of oxidized ores, zone of enriched sulphides, and finally zone of unaltered and lean sulphides. A dense limonite gossan commonly indicates pyrite beneath, and in such cases, owing to the strong reducing influence of the predominant pyrite, oxidized ores of copper may not be formed. Limonite is the characteristic mineral of the gossan, but in arid regions, hematite or specular iron ore may form. The zone of enriched sulphides is nearly always well developed wherever alteration has taken place. As a rule, chalcocite predominates in silicate rocks and porphyry, and in deposits of pyritic ore, as at Butte and Rio Tinto, while oxidized ores, notably the carbonates, are chiefly developed in limestone and porous sandstone. Daruse & Bard has pointed out that while copper carbonates are often abundant in a carbonate gangue there may be no enriched sulphide ore beneath owing to the relative insolubility of the carbonate ore, which collects above the ground water level and hinders the further transport of the copper. In some respects oxidized ores and secondary sulphide ores of copper thus mutually exclude each other in their occurrence.

The Spanish mines furnish an excellent type of chalcocite enrichment in dense pyritic ores. The climate is subtropical and the mean annual rainfall varies from 25 to 28 inches per annum. The gossan varies in depth from 45 to 90 ft., and its depth is at times an index to the depth of enrichment below. Oxidized ores are absent, and the enrichment consists chiefly in the alteration of the minute grains of chalcopyrite to chalcocite, with continual aggregation of the latter mineral. There is also, however, a good deal of secondary chalcopyrite deposited on the primary mineral. The ore at the top of the sulphide zone carries from 4 to 8% copper, and gradually passes down into lean pyritic ore, assaying 1% or less. The depth at which the unaltered ore is reached varies, in different parts of the district, from 200 to 1500 ft. below the outcrop. This enrichment has been the chief factor in the development of a big mining industry. All the copper produced in past ages was from enriched ore, and the bulk of the Rio Tinto copper production today is obtained from enriched ore.

At Mount Lyell, secondary sulphide ore, often highly argentiferous, has proved similarly profitable. Much of the ore mined today includes siliceous secondary bornite and chalcocite around the borders of the main orebody. It carries 5% copper, as against 2.35% or less, in the unaltered ore. One mass of rich sulphide ore, including much fahlerz and bornite gave 20% copper and 2000 oz. silver per ton, an output of 850 tons realizing £105,000.

The Katanga deposit is an example of extremely rich oxidized ore, forming an impregnation of porous sandstone, and extending to considerable depth. Deposits of this type lend themselves readily to wholesale alteration and enrichment, owing to their porous and stratiform character, which greatly promotes the circulation of underground waters.

In Canada and Alaska, the copper deposits, like those of other ores in these areas, have been subjected to a vigorous glaciation and erosion that has shorn off all the altered ore, and products of enrichment have consequently played no part in the economic development of the mines. The Lake Superior is another of the few great copper regions where superficial alteration has not been of any significance.

In the Appalachian watershed of the United States, most of the copper mines have depended on secondary sulphides, the primary ore being generally too lean. Thus in the Blue Ridge region of Virginia, the profitable ore was shallow and consisted of bunches of chalcocite (smut ore) aggregated from very lean ore disseminated in basalt.

The remarkable chalcocite enrichment at Butte has

[10] J. F. Kemp, *Economic Geology*, Vol. I, 1905, p. 11.

[11] *Economic Geology*, Vol. V, 1910, p. 59.

been determined by extensive fissuring and re-opening of the veins, which has lowered the water-zone to great depths. The miners long ago embodied the practical aspect of this effect in their dictum: "A dry and tight vein is barren; a wet and crushed one is rich." The oxidized zone has an average depth of 50 ft. and a maximum of 400 ft. Oxidized copper ore was generally conspicuous by its absence, except in the Bullwhacker mine, where rich bodies of chrysocolla were worked. The chalcocite ore, which has made the district famous, is succeeded in depth by the uncommon primary ore, enargite. Secondary covellite was abundant in the Gray Rock mine, Reno. H. Sales[12] has emphasized an important point, namely, that the lower level of the oxidized zone is practically independent of the topography, and often forms a horizontal line across ridges and valleys alike. The depth of the water-tables and of oxidation has been determined almost entirely by the character of the country-rock and by the distribution of fissures.

In Utah, Bingham commenced with lead mining, working cerussite ore in limestone. Beneath this, secondary gold ore was extracted for a while, and finally the rich chalcocite ore in porphyry was exclusively worked. It is succeeded by a lean pyritic ore. The country-rock has here been an important factor. Thus lead carbonate ore predominates in the limestone, and chalcocite in the porphyry, oxidation being naturally much deeper in the former rock. At Ely, in Nevada, the oxidized zone, 100 to 150 ft. deep, is generally leached and barren, although rich carbonate ore was mined at Copper Flat. Owing to the recent change from a humid to an arid climate in this region, the ground-water level is depressed into the sulphide zone, being 335 ft. deep. Secondary chalcocite ores are the main asset of the district, and only small bodies of primary ore (chalcopyrite associated with garnet) have as yet been developed.

Similar conditions prevail in Arizona. At Clifton and Morenci, the oxidized zone, from 50 to 200 ft. deep, is succeeded by the chalcocite-pyrite zone, which extends to a depth of 400 ft. or more. The lean pyritic ore beneath is not generally profitable. In the Copper Queen and Globe mines, at Bisbee, oxidized ore has played a leading part, the 'cave ores' of the Copper Queen, consisting of rich copper carbonate in limestone, being formerly famous. In the Globe district nearly all the valuable ore is oxidized. Bisbee shows a notable dependence of sulphide enrichment on fractures. The more massive and compact ore is often lean.[13]

In the Mexican copper districts, climate has been probably the chief factor in determining the extent of alteration. In Chihuahua, the Jimenez mine has been worked almost entirely on secondary carbonates and oxides, while at Las Vigas, malachite is abundant, passing to chalcocite at depths of 50 to 100 ft. The ore here is an impregnation of sandstone, the primary mineral being chalcopyrite. The Cananea mines depend chiefly on secondary chalcocite. Most of this district is elevated and has a comparatively high rainfall. The Los Pilares mine, also in Sonora, has a gossan of specular hematite which extends to a depth of 100 ft. Beneath this are secondary bornite and chalcocite, on which the mine has been chiefly worked, and which gave way to lean primary sulphides beneath the 500-ft. level. The enrichment here has been largely determined by later fracturing which gave access to surface waters.[14]

At Sonora, where the average rainfall is only 11 inches per annum, rich silicate ores occur to depths of from 200 to 400 ft., and are succeeded by a shallow zone of sulphide enrichment, and finally by primary ore. The shallowness of the alteration zones here has been attributed to the low rainfall, and the richness to the absence of erosion.[15] It is thus conceivable that a high rainfall and more vigorous erosion would have formed a leached gossan and driven the bulk of the secondary ore, as at Rio Tinto, down into the sulphide zone beneath the ground-water level.

The Chilean mines owe most of their prosperity to rich secondary ores developed in regions of low rainfall and slow erosion. In the desert areas, oxidation may reach a depth of 1000 ft. locally, and rich masses of chalcocite and oxidized ores are frequent. At Cerro de Pasco, which is situated on the Andean plateau of Peru, 14,000 ft. above sea-level, the oxidized zone, to a depth of 300 ft., carried exceedingly rich silver ore. Famatina (Argentine) is in a mountainous and dry region, where erosion is slow and the water-table deep. The gossan was leached of copper, but carried gold and silver. A zone of oxidized copper ore succeeded, carrying up to 15% copper, with 66 oz. silver, and 1 oz. gold per ton, while most of the primary sulphide ore carries only 3% copper.

FACTORS THAT DETERMINE SECONDARY ENRICHMENT

The chief factors that influence secondary alterations are the metal or ore, the gangue, the country-rock, the fissures, climate, topography, and the geological age and history of the deposit.

It has been seen that certain ores are not influenced by enrichment in place, unless residual concentration take place with leaching of the gossan. Under this head come tin, tungsten, platinum, chromium, and molybdenum. Further, iron ores in the state of massive specularite or magnetite, are not much affected by superficial alteration, especially when, as is usually the case, they are enclosed in highly resisting rocks. Iron carbonate in limestone is prone to alteration, and is seldom of value without it, and the same applies to manganese ore as carbonate or silicate. In the last case, oxidation is liable to extend further with the carbonate, but at the same time, the manganese oxide formed above is often cellular and less compact than that formed from silicate ore, owing to the solution and removal of some of the manganese as bicarbonate. Such criteria may be used, with due reserve, in estimating the depth and composition of the primary ore.

The gangue is often an important factor. In the

[12] *Economic Geology*, Vol. V, 1910, p. 15.

[13] F. L. Ransome, Prof. Paper No. 21, U. S. Geol. Surv., 1904, p. 145.

[14] S. F. Emmons. *Economic Geology*, Vol. I, 1906, p. 629.

[15] F. J. H. Merrill. *Mining and Scientific Press*, June 13, 1908.

case of lead and zinc carbonate and cerussite naturally develop in a carbonate gangue or country rock. With copper ore chalcocite tends to follow a siliceous or argillaceous gangue, while oxidized ores naturally malachite favor limestone or porous sandstone. In cases where oxidized ore is abundant in a carbonate gangue sulphide enrichment beneath is often poorly developed unless, as at Bingham, the country rock is different. The prevalent dense quartz matrix of gold veins does not favor extensive alteration, and gold ore with a calcite or quartz-calcite gangue is much more liable to enrichment. In this connection, the occurrence of platey quartz pseudomorphous after calcite in the superficial parts of gold veins suggests the possibility of secondary enrichment.

The physical and chemical character of the country-rock is similar in its influence to the gangue, as seen in the case of deposits in limestone. Deposits in highly indurated or metamorphosed rocks, as in the Kolar and Witwatersand districts, and many magnetite deposits, are not liable to be greatly altered. On the other hand, deposits in thermally altered igneous rocks, such as the Tertiary andesite, lend themselves readily to the action of underground waters.

The effect of subsequent faults and fissures, instanced at the Thames, Butte, and Bisbee, is obvious, and indicates the advantage of a detailed examination of geological structure. They are most marked in districts of Tertiary volcanic action, where subcrustal disturbance has continued after ore deposition. The association of bonanzas with secondary fractures, as at the Thames and in the Smuggler and Mollie Gibson mines of Aspen, points to the importance, in such districts, of carefully mapping faults and fractures as development proceeds. At Butte, the presence of fissures and the character of the country-rock has completely nullified the influence of topography on the level of ground-water.

Climate involves two variables, temperature and rainfall. A cold climate is less favorable to disintegration and secondary alteration than a warm climate, and an equable climate is less favorable than one with great seasonal and diurnal range. Thus it is that secondary alteration becomes more important as we approach the equator. Sunny mountain slopes are, for the same reason, more favorable to rich ore near the surface than the cold slopes. The higher the rainfall the more active is the circulation of underground water, which promotes enrichment, while the same amount of rainfall is more effective in a warm than in a cold climate. A low rainfall, on the other hand, gives a deep ground-water level, and extensive oxidation, though in districts of low rainfall the ground-water level is liable to extend below the base of the oxidized zone. The depth of ground-water therefore is not an indication of the depth of oxidation. The effect of rainfall is greatly dependent on the topography, since a heavy precipitation in mountainous districts leads to rapid erosion, which follows close on the heels of secondary alteration, and the primary ore is then very near the surface. The same is the case in recently glaciated areas. Again, rainfall is influenced by three factors, run-off, evaporation, and absorption. The first two are lost, the run-off in mountainous regions and the evaporated moisture in arid regions, while all three factors in turn are influenced by the geological structure and the character of the rocks. In arid regions where evaporation is intense a gossan of hematite may take the place of limonite and owing to the abundance of salt in the ground-water and in the atmosphere haloid ores of silver are liable to be found. The great future before gold and copper mining in tropical and semi-tropical countries demands a careful study of climate in its relation to secondary enrichment. We know the difference to man between a low lying, humid, and malarial district, and an elevated, dry, and healthy one often within a day's march of each other, but we are still groping painfully after a knowledge of the effect of these conditions on the mineral deposits that await exploitation in such contrasted regions.

The value of topography lies in the clue that it gives to the extent of activity of erosion processes. Topography and surface geology are essentially a reflection of climatic conditions, past and present. Other things being equal, topography influences the ground-water level and the depth of oxidation. Where the relief is bold and erosion vigorous, superficial alteration is seldom extensive. Where the relief is subdued and denudation is slow, we may find either the worn-down roots of lodes as in Otago, New Zealand, or, in some cases, considerable enrichment as in the south of Spain. In a worn-down mountain region, some enrichment may be looked for, but the persistence of the ore in depth depends altogether on how far the lodes have been denuded since erosion exposed them, and that is a problem not yet solved.

The geological age of an ore deposit is an important factor in some cases. The older deposits are in general enclosed in more resistant rocks, and having been exposed at the surface by prolonged denudation, they are commonly of deep-seated origin and composed of refractory ore less liable to superficial alteration. Further, such deposits have commonly a massive, unfissured structure, and are seldom situated in belts of recent disturbance, so that fractures and faults are not liable to affect them. In general, then, the older deposits are less liable to alteration than the younger.

The various factors that determine the extent of secondary alteration are intimately involved one with another, and the proper weight to be given to each can only be determined by a study of local circumstances. Only by such means can a just appreciation be gained of the possible effects of secondary alteration in any given case. At any rate, it should be the aim of applied geology to reduce to a minimum the element of trial and error which has hitherto bulked so largely in the prospecting, valuation, and development of mines.

Rainfall is an important factor in determining the mineral content of stream water. The average for surface waters in regions commonly called semi-arid is about four times that of the surface waters of humid regions.

The Black Hills of South Dakota—I

By William H. Storms

The existence of gold in the Black Hills of South Dakota was known many years prior to the great stampede of 1876. Lieut. G. K. Warren, in his report to the Government of his exploration of the Black Hills region, made in 1857, refers to the occurrence of gold in those mountains, and again, in 1859-60, Capt. W. F. Reynolds, in a report to Washington, speaks not only of gold, in the Black Hills, but also of silver, iron, coal, and copper. Gen. George A. Custer, in 1874, also reported the general occurrence of gold in the Black Hills.

The publication of the reports of these various military and scientific observers gave the occurrence of gold in the Black Hills widespread notoriety, but undoubtedly it was the return to the Hills of a number of General Custer's prospectors in the winter of 1874-75, immediately following the Custer expedition, that resulted in starting the famous stampede of 1876. About 25 of the members of Custer's party returned to the Hills at that time. As the country was within the Sioux reservation, the Government was compelled to take cognizance of this invasion by the gold seekers, and a military company was sent to the Hills from Fort Laramie, Wyoming, to round-up the intruders and take them out, which was done. Notwithstanding all the efforts of the Government to keep the gold diggers off the reservation, prospectors continually dodged the soldiers, and hurried into the forbidden land. The Sioux were hostile, and consequently the prospectors, between the soldiers and the Indians, had a hard time. It is related that one party of eight or ten men went in with a four-horse wagon and outfit. One evening they made camp on French creek. Indications were excellent for a storm, but some of the men struck out up the creek to prospect. A mile or two above their camp they discovered, much to their surprise, a camp of soldiers, but fortunately they were not observed by the latter. The prospectors hastily returned to their own camp and gave the alarm. As quickly as possible they broke camp and drove down stream to a place where the slopes were steep and rocky. Here they hid the greater part of their outfit, took the wagon apart, and by great effort moved it up the steep slope over the rocks where it would make no trail. The horses were led far enough away from the creek so that their neighing might not be heard by the soldiers, should any chance to pass that way. At nightfall it began to snow, and by morning there were two or three inches of snow on the ground, completely hiding the trail made in the canyon the day previous. They kept watch of the soldiers, however, and were much gratified, in the morning to see them break camp and soon thereafter ride quietly down the canyon past the hiding place of the prospectors, without the slightest suspicion that anyone was within miles of them. The danger being over, the miners quickly got their outfit in shape again and were soon digging for gold, their digging tools and rifles being side by side in the holes with them. When men were arrested a second or third time by the soldiers and recognized, all their belongings were confiscated and usually burned, and the unfortunate was escorted with others, to Fort Laramie, or to some more distant military post where they were liberated and warned once more not to return to the reservation.

So insistent were the people of the Western States that the Government purchase the Black Hills from the Indians and throw the coveted land open to settlement, that it was finally decided to send another expedition into the Black Hills region for the purpose of making a more thorough investigation of its mineral resources than had yet been made, as there were many who stoutly maintained that gold did not exist in the Black Hills in paying quantities. This expedition was in charge of Walter P. Jenney, and Henry Newton was appointed his assistant. The party proceeded from Cheyenne, Wyoming, to Fort Laramie, where it was joined by a military escort, and later many prospectors in the Hills materially aided in the exploration of the new country. This expedition, by its labors during the summer and early fall of 1875, established beyond all doubt the existence of gold in the beds of many streams of the Black Hills, though little quartz was found that would yield more than a trace of gold, even by assay.

The Government at once commenced negotiations with the Sioux for the session of that portion of their reservation comprising the Black Hills region, finally purchasing it from them, and early in 1876 the famous stampede commenced. Soon there were upward of 40,000 people within the region embraced by the two forks of the Cheyenne river—the Belle Fourche and the South Fork of the Cheyenne. Among the first discoveries of gold in the Black Hills region was that made by a half-breed named Toussaint Kenseler. He had been convicted of murder and was in prison awaiting the execution of the death sentence when he escaped and was not heard of again for a long time. One day he appeared at one of the Indian agencies, probably that at Pine Ridge, and exhibited several quills filled with small particles of gold which he said he had washed from gravel in the foothills of the Black Hills. From his description and a map which he made before his death, it was concluded that the place described by him was near what is now known as Lame Johnny creek, and about ten miles up the creek from the South Cheyenne river, near where the railroad now crosses that stream. In this vicinity are extensive beds of gravel and conglomerate. The material of which the gravel is composed is the hard metamorphosed schist, granite, and other rocks of the Hills, and vein quartz—in fact, the gold-bearing rocks of the mountains, so it is not strange that the gravel is also gold bearing. The conglomerate is not local, but is the stratum that marks the boundary between the Cretaceous and the Tertiary. It is composed of the same materials as the superficial gravel, and like it, is auriferous. This region has received no attention for many years, the richer gulches and bars of the streams within the Hills attracting the early-day miners, while in these later years the existence of

Minnekahta Limestone, at Sioux Pass, Black Hills, South Dakota.
From Darton, U. S. Geol. Survey.

Cambrian Quartzite Lying on Upturned Algonkian Schist, Deadwood, South Dakota.
From Darton, U. S. Geol. Survey

gold in the foothill region seems to have been overlooked or altogether forgotten. It may be that careful prospecting will discover, even at this late day, that the gravels of the foothills are well worth more than a passing glance.

It may seem strange to some that the members of the Jenney-Newton expedition did not find richer placers, and more evidence of mineral than they did. The only reason I can assign for this is that the greater part of their work was done in the southern and central portion of the Hills where the valleys are wider and travel was comparatively easy. The northern Hills, in which are situated the great Homestake mine and the so-called telluride ores, are for most part exceedingly rugged, and at that time must have been a most difficult region to travel through with the wagons and other paraphernalia of a military expedition. Deadwood gulch, the richest of them all, is a narrow canyon, and was a dense thicket of pine and spruce timber, with hundreds of fallen trees, deep washouts, and many other obstructions to the progress of the traveler. It is improbable that any prospector of the Jenney expedition visited that gulch at all, or the discovery that it was gold bearing would surely have been made and followed up with far better results than were obtained in any of the streams of the southern Hills.

The geology of the Black Hills is, for the most part, quite simple. In pre-Cambrian time a great area of schists, slates, quartzites, and other metamorphic rocks of Algonkian age was surrounded by the sea. These ancient crystalline rocks were tilted at a high angle almost uniformly to the northeast, with a strike northwest-southeast. The schists extended over an immense area, for wherever the erosion of the country extends below the Cambrian, schists of this character are exposed over a vast province, extending from the Rocky Mountain region eastward. In the region of the Black Hills the island slowly sank and as the waves encroached upon the land the detritus from the higher country was carried seaward by the streams, finding lodgment in the estuaries and along the shore, forming barrier reefs, spits, and benches of shingle, while in some places the waves cut terraces, processes such as are in progress today under similar conditions. The schists in this region are the metamorphosed sandstones and clay-shales which resulted from the degradation of a still older terrane, perhaps the Archean. They are exposed across the Hills for a distance of no less than 35 miles, but these upturned and altered sedimentary beds do not represent a continuous deposition of sediments during Algonkian time, for in many places in the Hills are found undoubted evidence of folding. On Rapid creek, near Silver City, can be seen one instance, where in a high bluff of blocky slate, the broad lines of sedimentation sweep like a rainbow across the face of the precipice, while the pronounced slaty cleavage is almost vertical. The schists contained many quartz veins—as many, in all probability, as today, and in certain belts these veins and zones of the schist were gold bearing. It is known positively that such was the fact, for in several localities the ancient gravel, now firmly cemented into a dense hard silicious or ferruginous conglomerate, yields gold. The most noted of these occurrences are those in the vicinity of Central City and Terraville, along Deadwood, Blacktail, and Bobtail gulches and their tributaries, and another locality, near the village of Rockerville, about twelve miles southwest of Rapid City. There are many miles of this conglomerate found around the rim of the Hills, but it is not all gold bearing, at least not in sufficient amount to be mined with profit. On upper Boxelder creek, near Custer peak, on Hat mountain, near the confluence of the south fork of Castle creek with the main stream, and at some less noted localities, the conglomerate is copper bearing—the native metal being present at Hat mountain. The copper in these cases was, no doubt, derived from the copper-bearing schists that underlie them. In some places the gravel is but lightly cemented. Three miles above Deerfield, on upper Castle creek, the bed of gravel is 30 ft. thick, uncemented, and contains no copper and as far as known but little gold.

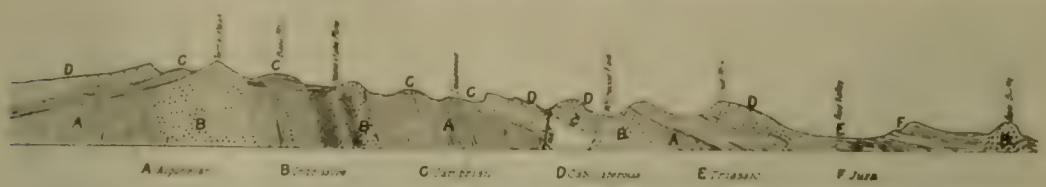
In the deeper waters of the Cambrian sea the sediment deposited was sand, forming by metamorphism a hard dense quartzite, due to the infiltration of a large amount of secondary silica. Pebbles in both the conglomerate and quartzite seldom or never free themselves from the matrix when broken, the line of fracture passing through rather than around the larger fragment. As the land sunk, the sediments continued to accumulate on the floor of the sea. The detritus alternated between coarse and fine sand nearer the shore, and silt in deeper waters. Often these sediments were accompanied by calcareous material, for calcareous shales and sandstones are abundant in these Cambrian rocks, and it is chiefly due to this calcareous material that the Cambrian strata in Tertiary time, became the depository for large amounts of gold-bearing ores. Generally the sands were gray, often deep red, and occasionally white. Many of the sandstone strata are green, a result of the occurrence of a vast amount of the iron silicate, glauconite.

After the close of the Cambrian, the Ordovician, is represented by about 80 ft. of buff limestone above which lies the Carboniferous, the Devonian being, as far as known, entirely absent in the Black Hills. All of the sandstones and shales of the Cambrian contain traces of gold which is probably of mechanical origin, running in some places as high as $2 per ton. The ore deposits previously mentioned as occurring in the Cambrian should not be confused with those just referred to, the latter being contemporaneous deposits, whereas the richer ore deposits are associated with intrusive rocks and are of secondary origin.

Following the Carboniferous came the deposition of the Triassic and Jurassic sediments, and after them the Cretaceous. At the close of the latter, the Black Hills region, which had been slowly sinking during all these ages, was now uplifted, and the entire series of sediments which had encroached far upon the Algonkian island, as it sank, were at this time lifted from their horizontal position, forming a great dome-like anticlinal mass, the strata of which

dipped away from the central portion of the uplift in every direction toward the great plains, in which the Black Hills now rise like an island in a sea. Erosion immediately began, and it was at this period that the gold-bearing conglomerate in the foothills was formed at the base of the Tertiary. The Tertiary was deposited in a fresh water lake and the sediments must eventually have reached a great thickness, extending far up into the Hills, and may possibly have covered them completely. As to this there can never be any positive knowledge, but remnants of Tertiary are now found high up in the mountains, one notable occurrence being that at the southern end of the town of Lead, near the divide between Poorman gulch and Gold Run.

On the surface of these gently undulating beds of the Tertiary, streams began to cut their channels, as the entire region once more was slowly lifted. As the uplift proceeded these channels cut their way ever deeper into the soft strata, the entire surface



Geologic Cross-Section Passing Through the Black Hills in a Northeast-Southwest Direction Near Deadwood.

of which was being itself degraded by those never ceasing elements of destruction—heat and cold, rain and wind. The direction of the streams having been thus determined, they continued in those channels, cutting down into the underlying rocks, in time reaching even the Algonkian schists—the basement rocks of the entire region. While these canyons were being cut out by the streams a vast mass of the older formations—Cretaceous to the base of the Cambrian, was also being removed from the great dome, the Algonkian finally being exposed over a broad eliptical area, and an immense amount of those hard crystalline rocks carried away.

The peculiar drainage of the Black Hills can only be explained by the above hypothesis, for in no other manner could these streams have cut directly through great mountains of hard rock which lay in their course. Ordinarily, a stream, meeting an obstruction, will flow around it, but some of these Black Hills streams are seen to cut through, not around these mountain masses which now look as though they must have obstructed their way, but it must be remembered that the stream courses were determined when they were first formed on the surface of the Tertiary lake bed and when the older rocks through which the streams now run were buried thousands of feet beneath the surface of those Tertiary streams. The Belle Fourche and South Fork of the Cheyenne river and some of their tributaries form the most noticeable examples of superimposed drainage. The erosion of this domal uplift has resulted in the formation of a series of concentric escarpments which encircle and face the Algonkian area of the central portion, each formation, in turn, dipping beneath a younger one. Certain of these formations, in places, are found forming the surface over considerable areas. Such for instance are the Lower Cambrian quartzite which lies at or near the surface over several square miles southeast of Deadwood, from the head of Spruce gulch toward Perry; the massive gray limestone (Pahasapa) which forms the surface over many miles in the western portion of the Hills and the purple limestone (Minnekahta) which is conspicuous in the foothills forming precipitous walls, where cut by streams. Over great areas it lies at the surface and presents the appearance of a rude tessellated pavement.

LAND SURVEYS IN ALASKA

In addition to its other work in Alaska the United States Geological Survey will during the present fiscal year make public-land surveys under plans approved by the Commissioner of the General Land Office. An appropriation for this work was made at the last session of Congress in an act which authorizes the Secretary of the Interior to make the surveys by means of the Department's own employees instead of by contract with other surveyors, as heretofore. It is believed that under the new system the work will be greatly accelerated.

The appropriation will be used for subdividing the agricultural lands of Alaska so that they may be taken up as homesteads. The work to be done this season will cover the arable lands around Fairbanks, where many homesteads have already been taken up. A standard parallel and prime meridian will be established and, if time is available, some township lines will be run. The sectional lines will be run next season.

These surveys will be made under the general direction of Alfred H. Brooks, in charge of the division of Alaskan mineral resources of the Geological Survey. R. H. Sargent will have direct charge of the field operations. He will be assisted by C. L. Nelson, W. N. Vance, and S. G. Lunde. Mr. Sargent's party, which sailed from Seattle for Skagway on July 5, includes five or six other assistants, and additional men will be employed at Fairbanks, where horses and supplies will be purchased. The work will be carried on by three parties, each including six to twelve men and six horses. After organizing the work at Fairbanks, Mr. Sargent will go by trail to Valdez. He will make preliminary examinations in the Copper River valley for the purpose of preparing comprehensive plans for land surveys in that region. Mr. Brooks will leave Washington about July 20 for Knik and Cook Inlet, where he will make investigations on which to base land surveys in that district. Later he will visit the Fairbanks parties.

Hand Drilling in Alluvium

By Ernest K. Hall

*In drilling dredging ground not deeper than 40 ft., it is nearly always possible to do the work with hand tools. Quite as accurate results may thus be obtained as by the use of a power plant. The superintendent can quite easily and efficiently attend to three or four sets of these tools and crews, and low first cost and great mobility also favor the hand drill. Boring for an accurate sample is always a delicate matter, and calls for constant watchfulness and resource, though this has often not been fully realized. Many sample holes have been put down without casing, or if casing was used its function was merely to prevent the sides of the hole falling in from above the tool.

A derrick of three light round sticks, giving 17 to 18 ft. head room is set up over the station, and a windlass set across two of the legs for raising and lowering the rods and tools. Suitable windlass rope is $\frac{3}{4}$ in. flexible plough steel. In raising the casing, after a hole is finished, the dead weight of the pipes is a small matter compared with the friction to be overcome, especially where stiff clay has been traversed for a few feet, or where the casing has become jammed among broken boulders. It is handy to have always hanging from the derrick head a 1.5-ton chain hoist. In pulling the casing, give it a turn or two just before pulling with the hoist. If this is insufficient, two sapling poles, like those used for turning the pipe, may be attached to the casing near the ground, by close link chain, and opposite one another. These then may be used as levers.

It is important that casing, rods, and tools be of some standard length. Thus all tools may be 3 ft. in the clear, casing 5 and 10 ft.; rods the same. If this precaution be observed, it is known at once what progress each hole has attained, and how much the bottom of the casing is below the tool. For joints between the casing lengths I prefer the bayonet coupling to a screw thread. It may be thought that this joint is insecure, but so long as the pipes are turned in one direction only, this is not so. I have never found trouble from this cause, even with work manned by ignorant coolie labor. On the other hand, much time and annoyance is saved by its adoption in preference to the screw point. The bottom pipe is shod with a steel cutting shoe, toothed all around its circumference. The shoe's inner diameter should not differ from that of the pipes, which will be anything from 3.5 to 4.5 inches.

When the table is set on the top pipe, and it has on it the weight of two men, a third operator will generally, by turning the pipe line with a pole lever attached by chain, be able to sink the casing a foot or more at a time depending upon the kind of ground being traversed. If this method is not effective the casing must be driven by means of a hardwood block weighing about two hundred pounds, and provided with four arms of 1-in. round iron for lifting. The core of ground is cut and removed by whatever tools are appropriate, to a depth of from six to ten inches above the bottom of the casing. Since the accuracy of the whole operation depends very greatly on the care used in not letting the tool penetrate below the casing, it is advisable always to leave as much as possible of the core near the bottom of the casing untouched, until this is lowered another stage. When a boulder stops the shoe it is necessary to break and remove it with the tools, but in this case, as a general rule, small material will not flow in from the sides to vitiate the sample. Still, it sometimes will do so, especially if the boulder is so steeply inclined, or irregular in shape, as not to close the bottom of the pipe, while the surrounding fine material is of running consistence. This condition may be known by the abnormal quantity of material brought up to the surface, with no corresponding increase of depth. In such a case, if appreciable gold comes up with the borings, the only safe course is to reject that bore-hole and start afresh. Buried timber will be found the worst obstacle, and if a thick and solid log be found, it is seldom possible, or worth the while, to bore through it.

Complete notes should be made of every bore-hole, with a description of every obstacle, and of every variation of material. In describing clay it should be graded according to the greater or less difficulty in puddling it. Every three or five feet of core should be panned separately, and the resulting concentrate kept as a separate sample, and the gold separately determined. By this means the variation in gold value may be roughly estimated. This estimation of the relative enrichment of each horizon cannot be accurate in wet loose ground, because the action of the tools causes concentration toward lower levels, and, moreover, makes the line of contact between different beds indeterminate. If the bedrock is soft and rotten it is difficult, sometimes, to determine whether or not it is a band of alluvial clay or false bottom, and until the operator is well acquainted with the ground it is well to bore some feet into an argillaceous bottom.

Characteristics of the bedrock must be very carefully noted. A hard, rough, and uneven bottom will often put bucket dredging out of the question. A bottom of stiff clay, in which there is a large proportion of the gold, will also be a serious matter. On reaching a hard bedrock it should be bored into from two to four inches, after which a sample may be taken as follows: a handful of very tenacious kneaded clay should be pressed on the bottom of a wooden tamper tool, which is merely a cylindrical piece of wood an inch less in diameter than the bore-hole, and resembles a flat ended rolling pin more than anything else. The tool is then lowered and knocked lightly on the bottom twice. It should then be brought to the surface, and the clay puddled and washed, the process being repeated until no appreciable bedrock fragments are brought up. In boring the bedrock the tamper is not used until all that can be is brought up by the usual tools, but the tamper effectually seizes coarse gold, that would otherwise be neglected. Soft bottoms must be drilled into until colors are no longer raised.

*Abstract from *Australian Mining Standard*.

Use of By-Water Supply for Hydraulic Mining

By Dennis H. Stovall

No matter how rich the gravel, without an adequate water-supply used to the best advantage a hydraulic mine is nothing more than real estate. Sometimes the mistake is made of using the entire water-supply for the battery, reserving none for 'by-wash.' This is false economy and proves a serious detriment, particularly in washing ground that contains many heavy boulders. No matter how much gravel is broken from the banks, little progress can be made if the sluices and bedrock races are not kept open. This requires plenty of water for by-wash. Some of the most successful hydraulic mines in northern California and southern Oregon use the same quantity of water for by-wash as is discharged through the giants. This appears like a waste of valuable water to the miner who has been accustomed to operating a big giant battery and using a small flow for by-wash; but it results in getting a greater quantity of gravel through the sluices within a limited time than can be accomplished by any other method.

A poor water-supply may be made good by proper handling; and a good supply can be made much better. If three giants are operated with a slight flow of by-water, and one or two of them must be turned from the bank two or three hours each shift to assist in clearing the race, much better results would be obtained by cutting out one of the giants and diverting its water into the ditch for by-wash. The flow of the latter will then be heavy enough to keep the race clear, and the remaining two giants of the battery will be free to work continually on the banks. Once a race is choked with boulders and débris, it can only be opened after the loss of much valuable time. The final clean-up is gauged, not by the quantity of gravel torn from the banks but by the amount broken up and washed through the sluices. The by-wash plays just as big a part in this process as do the giants and therefore demands as much attention. Where plenty of flow is given the by-water channel it is still necessary that it be delivered as close to the point of operation on the gravel bank as conditions will allow. In this way huge boulders torn from the bank by the giants are picked up immediately and kept on the move. It is a fact well known to every placer miner that a boulder on the move gives no trouble, but that those allowed to stop flat side down must be 'bucked' from their resting place before the water can set them rolling. So the shorter distance between the point of operation and the entry of the by-water, the less work will be required to keep the race clear.

In the accompanying illustration, made from a photograph of a southern Oregon hydraulic mine,

Use of By-Water With Giants in Hydraulicking.

the flow of by-water is equal in volume to that discharged through the two giants. The by-wash enters the pit at a point only a few yards below the giants, and though there is an unusual number of heavy boulders in the gravel of this mine, they are easily handled.

A method of using the by-water to the best advantage in mines where the flow is necessarily low, is by employing a self-shooter. This conserves the water and releases the accumulation at intervals. The periodic discharges break loose the stranded boulders and débris, and hurl the entire mass through the race. It is much like the occurrence of a freshet every half or three-quarters of an hour. It does effective work in keeping the race and sluices open, and at the same time does no harm to the riffles and boxes. The reservoir and automatic gate for the self-shooter can easily be built by any mine foreman, no other materials being required than those already at the mine. It can be constructed at any convenient point along the course of the by-water channel, but better results are obtained by placing it as near the

diggings as possible. At the lower end of the reservoir a gate is constructed. This is built of wood, and made to slide up and down between flanges, the main supports being two 6 by 8-in. timbers braced and driven firmly into the ground. Just over the gate a lever is hung between the two posts. A cable connects the short end of the lever with the gate, and from the long end an ore-bucket hangs. A joint of hydraulic pipe is set at the maximum level desired for the reservoir, and when this level is reached, the water escapes through the pipe and overflows into the ore-bucket.

When the bucket is full of water, or nearly full, its weight is sufficient to pull down the lever and lift the gate, thus releasing the water in the reservoir, which goes tearing down the race to break loose and carry away the accumulated boulders and gravel. A small cock is placed at the bottom of the ore-bucket, and so regulated that the bucket and the reservoir are emptied at the same or nearly the same time. When the water in the bucket is released, the gate, which is heavier, drops into place again, and the reservoir fills as before. After a few trials the self-shooter can be regulated to operate perfectly, and will require little or no attention.

A HASTY CONCLUSION

Our readers will, we are sure, appreciate the humor of the situation revealed by the following letter referred to us, without comment, by L. E. Aubury, State Mineralogist. The offending item was originally published in 1865 and was re-published under the old date line in our Anniversary Number, as an illustration of former conditions. If Mr. Gregg had read the paper with any care he would have saved himself disappointment. However, he has had a trip to Yuba county, and that is worth something to anyone.

July 1, 1910.

Mr. Lewis E. Aubrey, S. M. Burea, S. F.

Mr. Aubrey:—I went to Smartsville thinking I could do something with an extensive hydraulic operation which the *Mining and Scientific Press* stated was going on there. If you will refer to the issue of May 21, 1910 p 768 under heading Yuba County you will find stated that the Blue Gravel Company has had clean ups of $46,000, $26,708, and $50,786 this year and that last year the earnings were over $200,000.

The fact is that for three years (I have been told) there has been some effort to exploit an old property there at considerable expense with problematical schemes, and so far from clean-ups are they that there has been no water for washing gravel even on a small scale, the projected ditch is not yielding water and it is not likely to for some months. I was told that it is the only mining operation about Smartsville.

Somebody has evidently made a fake, a fraudulent news item, and it would seem the the *Mining and Scientific Press* is to blame. Truly

WILLIAM GREGG.

224 Mill St. Grass Valley Calif.

Deputy Mineral Surveyors and Mineral Locations

By H. W. MACFARREN

It is well recognized that United States deputy land and mineral surveyors by the knowledge gained in the performance of their official duties, in their access to records, and in their ability to obtain advance information, are in a position to make desirable entries on public land, and are under considerable temptation to act fraudulently and corruptly to their pecuniary advantage in this respect. The deputy mineral surveyor sees many opportunities to locate mining claims or make other entries or filings. In surveying for patent claims that have been staked too large, there is the temptation to become a silent partner in the location of the fractional claim or claims left, to the injury of the client who is properly entitled to make these locations. This happened recently in a Nevada camp, where the chainman located such a fraction which contained the apex of an important orebody, but it was probably the chronic carelessness of the deputy rather than any corrupt motives on his part that allowed this. The Government attempts to protect itself and the public against venal deputies by requiring that its appointees be of good moral and professional reputation, and by enforcing the laws and regulations to a degree which is often a source of ridicule by those who have not carefully studied the subject.

The Government early foresaw the mischief and poor morals that would result if certain of its employees were not removed from the temptation to deal in public land, and in consequence enacted section 452 of the Revised Statutes, which with the subsequent circulars and decisions of the General Land Office constitutes the present law on the subject. The section reads: "The officers, clerks, and employees in the General Land Office are prohibited from directly or indirectly purchasing or becoming interested in the purchase of any public land; and any person who violates this section shall forthwith be removed from this office."

In a circular (11 L. D., 348) referring to the above act, the Commissioner of the General Land Office, said: "In accordance with said decision, all clerks, officers, and employees in the offices of the surveyor-generals, the local land offices, and the General Land Office, or any persons, wherever located, employed under the supervision of the Commissioner of the General Land Office, are, during such employment, prohibited from entering, or becoming interested, directly or indirectly, in any of the public land of the United States." In a later circular (34 L. D., 605) the Commissioner more rigidly drew the restriction by saying, "Acting under the spirit of this law and the decisions referred to, this office will recommend the removal or dismissal of any of the above-named officers, clerks, or employees who shall, whether for themselves or others, in an manner negotiate for, buy, sell, locate, any warrant, scrip, lieu land selection, soldier's additional right, or any other

negotiable right or claim under which an interest in the public land may be asserted, as well as such officers, clerks or employees who shall except in the discharge of an official duty, help or in any manner whatever furnish any information to or in any manner be in communication with any person, firm or corporation dealing in such rights in relation to such rights.

While Sec. 452 of the Revised Statutes does not prohibit the acquisition of title to public land of the United States under appropriate laws by the wives of officers, clerks or employees of the Land Department, it is not deemed advisable or proper in the interest of good administration that they should do so. Accordingly, such purchase or acquisition of title, directly or indirectly, to any of the public land by their wives, prior to the separation from the service of such officers, clerks, or employees, will be deemed a sufficient cause upon which to base a recommendation for removal or dismissal from service of the officer, clerk, or employee whose wife acquires or seeks to acquire title to any of the public land." The Secretary of Interior said in the case of Sherrard Coleman (18 L. D., 394), who, while under contract with the Department of Interior for the survey of certain public land and in consequence a United States deputy surveyor, filed a declaratory statement to purchase certain coal land, "In the prosecution of his work the deputy surveyor is clearly under the control and supervision of the surveyor-general; as a deputy he has access to the records in the office of the surveyor-general, and the compensation he receives comes from that officer. I am of the opinion that Coleman was disqualified from taking any part of the public land while a deputy United States surveyor, and hence his filing should be canceled." In the case of Robert J. Watson (33 L. D., 435), who filed application to purchase timber land while commissioned by the Secretary of Interior as a Forest Ranger of the General Land Office, the Secretary of Interior said to the Commissioner, "it clearly appears that claimant was an employee of your office, and hence disqualified by statute from making the entry in question." The Secretary declined at that time to pass upon the question of the claimant being allowed to resign his commission and perfect his entry.

The substance of three decisions, (24 L. D., 393; 29 L. D., 76; 29 L. D., 333), is that deputy mineral surveyors are land office employees and together with surveyor-generals are disqualified as mineral entrymen. That entries for patent to mining claims made by them are to be canceled, while in those cases where their names appear among other co-applicants, patent will be allowed only after their names have been removed from the application. In the case of Floyd *et al v.* Montgomery (26 L. D., 122), the same was held and a further step taken when it was said that attention would be given to the recommendation looking to the revocation of the commission of the deputy mineral surveyor who officially reported on the claim to the surveyor-general while holding an interest in it. A more liberal interpretation of the statute was given in the case of W. H. Lethgwell (30 L. D., 139). A deputy mineral surveyor who has no interest, real or contingent, in a mining claim at date of survey thereof by him, nor at date of application to patent thereto, but who subsequently makes entry thereof does not come within the spirit of Section 452 of the Revised Statutes. In this case the deputy obtained an interest in the claim which he had not contemplated taking before after the application was first made for patent, and was the principal in the final entry necessary on patent applications. The Secretary of Interior held in the instance of Seymour K. Bradford (36 L. D., 61), "Under the authorities a deputy mineral surveyor is within the purview of said section 452, and consequently is prohibited from making a mineral location, upon penalty of the forfeiture of his official position. It may be that Bradford acted without actual intention to violate the Statute, but ignorance excuses no one. That the locations made may be defeated or proved to be voidable does not clear him. He, while a mineral surveyor, was directly and beneficially interested, as a co-locator, in the City Bank placer claim in violation of the Statute and of necessity the penalty, to-wit, his removal from office, must follow. The appointment of Seymour K. Bradford as a United States mineral surveyor must be revoked." It was said in the case of Philip Contzen (37 L. D., 489), a deputy mineral surveyor who made a homestead entry upon public land, "The making of an entry of public land by a deputy mineral surveyor will be sufficient cause for the revocation of his appointment as a deputy mineral surveyor." No mention was made as to whether the entry would be canceled.

Whether a mining location made by a deputy mineral surveyor is valid or invalid is a point that the Department of Interior has discreetly avoided passing upon. The Utah court in the case of Lavigno *v.* Uhlig decided that such a location was void, while a Nevada court held the contrary on the unquestionably erroneous conclusion that deputy mineral surveyors are not land office employees. A careful study of the wording of the two circulars quoted before leads to the belief that if the Department were called upon to decide the specific point, it would without hesitation hold that such locations were void. Costigan in his admirable work on mining law refers to the necessity of protecting innocent purchasers of such locations, and infers that the location should be voidable by the Government only, placing it in the same category as a location made by an alien. But the location of mineral ground by an alien is seldom, if ever, inconsistent with the best interests of mining, and the Government acts accordingly, while a location by a deputy mineral surveyor, even if it hampers no one in the execution of their desires, is not in accordance with sound public policy or productive of good public service. In view of the more recent and present strict interpretation and enforcement of the laws and regulations, it is probable that the deputy who makes a mining, agricultural, or other location, entry, or filing upon public land, will suffer both the loss of his commission and the cancelation of the entry.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

An efficacious antidote for cyanide poisoning is several drops of ammonia on sugar, eaten immediately. In cases of external poisoning a bath in warm water containing bicarbonate of soda and common salt is recommended.

The placer deposits of the Bearpaw mountains in Montana are of very little importance, although some coarse gold has been recovered by panning and sluicing of some of the small gravel bars occurring along drainage ways throughout the group.

A catalytic agent is a substance which promotes a chemical change, or interaction between two substances, without itself suffering any permanent change. The change may be of a positive, accelerating, or of a negative, retarding, character.

Concrete for machinery foundations is often mixed in the following ratio: 22½ cu. ft. 2-in. rock, 7 cu. ft. ½-in. rock, 13 cu. ft. washed sand, and 1⅘ bbl. cement. The surfaces and covering of the blocks should be considerably richer than this in cement, the amount being almost doubled. Concrete battery foundations are now standard and are the only really satisfactory ones for heavy stamps.

The cost of sulphuric acid depends on the price of coal, pyrite, and saltpetre. That being the case, it would appear probable that Utah and Colorado, owing to their proximity to almost inexhaustible supplies of pyrite and coal, will become in time important producers of sulphuric acid. There exists in Utah and Nevada important deposits of nitre which for various causes have not been exploited.

The change from one polymorphic crystal form of a substance to another in some instances takes place with great slowness upon change of conditions, in other places rapidly. In some cases the transition may take place in either direction upon changes of conditions; the process is then enantiotropic. In other cases the process is possible only in one direction, from a metastable to a stable condition. Such a process is monotropic.

From tests of trap and other rocks, it is seen that a material saving can be effected by the use of trap for ballast purposes. Less stone will be required to maintain the track, and it can be used in smaller sizes, as its higher percentage of hardness and toughness insures less breakage under traffic. Figures taken from comparison of line and surface in trap with that in stone whose quality is about the same as limestone, show that line and surface cost approximately $20 less per mile in trap than in limestone.

In the daily control of millwork, particularly that of an experimental character, it is desirable to make the labor of computation as light as possible, so that results for rate of crushing or the contents of a vat can be read off rapidly after making the required observations, such as weighing pulp. For this reason it is convenient to have a suitable table prepared to meet any special case, and an hour or two spent in making such a table will be saved many times over in the subsequent work when systematic experimentation is carried on.

The Bureau of Forestry has established regulations governing the appropriation of water-powers located on streams which drain watersheds included in whole or in part in forest reserves. Among these regulations is the imposition of a graduated rental, to be paid by the individual or corporation appropriating the water-power and used by the Government for forest purposes. This rental rests upon the assumption that the appropriator of the power will be benefited by the preservation of the forest, and this idea is accepted generally by engineers and by the public.

The advantages in filling in underground work are: little timber is required, the complete extraction of ore in the lode, all waste rock is stored in the mine, a fairly clean product is sent to the surface, ease of stoping and reduced cost of mining, the repeated use of filling for support of mine workings, and the placing of levels considerable distance apart. The disadvantages are: its application is limited largely to steeply inclined lodes, cost of building pack-walls, considerable handling of the ore in stopes, collapse of upper level on withdrawal of filling and danger of a crush starting and extending to the lower levels, and loss of ore by mixing with waste in cutting out arch pillars.

Mill-men in various districts often fail to agree as to the proper grade to give mill plates, their ideas ranging from 1 inch or less to as much as 2½ inches, or more to the foot. This difference in opinion among men who should know, probably represents the extent of their personal experience in the districts where they have worked. The fact is, the character of the ore must determine the grade of the plates, and the proper amount of water to use as well. An ore heavy with sulphides, or other mineral of high specific gravity, requires a heavier grade of plates than ordinary quartz ores, and also demands a larger amount of water in the battery than the latter.

Ocher as the term is ordinarily used is applied to the earthy and pulverulent forms of the minerals hematite and limonite. It is always rendered more or less impure through the presence of other metallic oxides and of argillaceous or clayey material. Natural ochers show a variety of colors, which depend on the chemical composition, in general. Hematites give red ochers and limonites give yellow, buff, or brown. The amount and kind of impurities also influence the color. In brief, the natural color of ocher depends on the degree of hydration and oxidation, and the kind and quantities of impurities. As the color of ocher depends mainly on the degree of hydration, a red ocher may be made by calcining common yellow ocher.

Special Correspondence

LONDON

Palmarejo & Mexican.—Butters Salvador.—St. John Del Rey.—Selukwe.—Broken Hill Proprietary

The Palmarejo & Mexican Mining Co. owning silver-gold mines in Chihuahua has been before the London public for nearly a quarter of a century. In the early days at least one of the leading American mining papers had a good deal of advice to give English investors with regard to this project and uttered notes of warning with regard to the character of the men in charge and also in connection with the alleged value of the ore. The warning fell on deaf ears, with the consequence that large amounts of capital were recklessly squandered. Eventually the incapable directors and engineers were removed, and afterward several men of position made attempts to improve the methods of mining and metallurgy. It was found that the orebodies were irregular though extensive and the content low, averaging 2 dwt. gold and 15 oz. silver. The ore was of too low grade for amalgamation and would not give good results by any cyanide process known at the time. Eventually, two years ago, E. T. McCarthy's advice was taken, and he reported that the process now in use in Nevada and in other parts of Mexico would be applicable to Palmarejo ore. He examined the property and indicated the best lines for exploration and development. The chairman, John Parry, has just returned from Mexico and has given the latest information. The development work has exposed 140,000 tons of ore averaging 2.4 dwt. gold and 14½ oz. silver, and at several points the orebodies give indication of further reserves. It is intended to continue developments for a few months longer and then to erect a new metallurgical plant. In the meantime the old plant has been cleared and the foundations prepared for the new; and plans have been adopted for an aerial ropeway to connect the mine and mill. Mr. McCarthy reports that a greater quantity of ore had been found per foot of development than he had originally anticipated, and that consequently the 5665 ft. has cost only 2s. per ton of ore developed. Taking the content at 38s., Mr. McCarthy expects that the profit will be 18 to 20s. per ton. More money has been and will be required, so the capital of the company has been re-arranged. A third series of debentures for £30,000 was issued recently in order to provide funds, thus making the total debentures £80,000. The nominal capital has been reduced from £875,000 to £350,000 by the cancelation of 15s. on each of the 700,000 shares of £1 each. The capital consisted of 700,000 £1 shares and 700,000 5s. shares, all ranking equally for dividend purposes. The 5s. were issued in 1909 on these favorable terms, as a substitute for reconstruction. Of these two classes of shares 679,063 of the £1 shares were issued; the whole of the 5s. were issued and 2s. 6d. called up. The subscribers to the third debentures have the option of taking any unissued or unsubscribed shares in exchange for the debentures.

Progress at the Butters-Salvador gold mine is excellent. The English company was formed in 1899 to acquire gold mines opened up by Charles Butters in the Santa Rosa district, Republic of Salvador, Central America, 40 miles from the port of La Union, and until recently the doings have not been advertised here, consequently details have not been generally known. Two orebodies have been worked, the San Sebastian and San Miguel; these are probably connected and exploration of the ground between the two is now being undertaken. Mining is done by adit, and the main level is 600 ft. below the highest point of the outcrop. The capital is £150,000 and dividends were first paid in 1903, when 5% was distributed for the year ended June 30, 1903. Succeeding yearly dividends have been at the rate of 55, 40, 55, 75, 80, and 68¾%. The amount of ore treated during the past year was 21,664 tons and the yield was 38,504 oz. The sale of bullion realized £151,520. Mining, milling, and cyaniding cost £55,037, depreciation £3590, mine development £15,532, and London, New York, and San Francisco expenses £3,05[illegible]. The divisible profit was £68,129 and with £4,0[illegible] brought in from the previous year made an available profit of £[illegible]. Out of this £102,1[illegible] has been distributed to shareholders, the rate being 68¾%. The most recent cable reads: "Ore in a few weeks has showed that developments have greatly added to the reserves, which now amounts to about 200,000 tons averaging 3 dwt." It is probable that in the near future more will be heard of the shares in the London market.

The St. John Del Rey Co., operating the Morro Velho gold mine in Minas Geraes, Brazil, was formed originally in 1879. The report covering the year ended February 28 shows that 187,837 tons of ore was raised and after sorting out 2% 181,000 tons was sent to the battery of 120 stamps. The yield in the stamps and by the succeeding oxygen process was 101,003 oz. or 15s. 9d. per ton, the total realizing £146,530. In addition, from the Cuiaba mine gold valued at £21,788 was recovered. The working cost was £277,161, development £14,702, taxes etc., £20,490, and London expenses £3899, leaving a profit of £121,861. Out of this £55,849 was allocated to expenditure on new works in connection with electric power, £5458 was paid as interest on debentures, and £10,583 as dividend on the preference shares. The distribution on the ordinary shares was £48,177. These amounts paid to debenture and shareholders include English income tax, after deducting the tax the rates of interest or dividend are 7, 10, and 8½%, respectively. The directors are now proposing to create 100,000 second preference shares of £1 each, carrying 10% dividend, in order to provide the necessary funds for discharging the debentures, of which £31,475 fall due in 1911 and £36,275 in 1913. Though these are created, it is not likely that many will be issued, as most of the debentures are to be renewed. It is noteworthy that the yearly amount of ore treated is gradually increasing, a fact due largely to the efficiency of the new electric haulage system. The tube mills recently installed have improved the extraction by the 'oxygen' process, but they are found to consume much power, an expensive item at St. John Del Rey. The question of the life of the pebbles used for grinding is an interesting one. Imported flints and local silicified iron carbonate have been used. The former last five times as long as the latter, but the relative prices delivered are £9 and 17s. 6d. The pyritic concentrate is twice the specific gravity of the pebble and the iron carbonate is practically of the same specific gravity, the grinding efficiency of the latter being therefore much greater. The iron carbonate has also the advantage of containing a small amount of gold, most of which is recoverable. The report of the engineer, George Chalmers, contains an unusual amount of interesting details relating to the conditions of the mine.

The Selukwe gold mine is one of the oldest in Rhodesia, having been working since 1898, and during the years 1902-3 dividends were paid. Later the quality of the ore decreased, and last autumn the mine showed signs of exhaustion. The Chartered company and the Bechuanaland Exploration Co. came forward and guaranteed the issue of 100,000 new shares of 5s. each for the purpose of further capital wherewith to continue prospecting and development. At the same time, A. H. Ackermann, the Chartered company's engineer, proceeded to the mine to direct operations. A report by Mr. Ackerman, dated May 21, has been published stating that development had not revealed any profitable orebody, but a cable dated June 20 has since been published announcing that 80 ft. driven on the tenth level of the Nigger Reef property had assayed 8½ dwt. over a stoping width of 4½ ft. The discovery makes the outlook more encouraging.

The Broken Hill Proprietary is treating its dumps for zinc concentrate by means of the flotation process, and is earning a handsome revenue from these two sources. At the same time it is not depleting its ore reserves while the prices of metals are low. The company is starting in a small way to make spelter at Port Pirie. The works there have been placed under the charge of Mr. Arneman, a Belgian expert. The preliminary work done is described as having caused far less difficulties than usual in starting a new industry.

That there have been difficulties is admitted, but in view of the well known conservative nature of the management it is recognized that such an announcement means that very satisfactory progress has been made. As far as the other mines go they are all developing well except at the Junction North mine and the Block 10 where it is becoming evident that the orebodies do not extend to the depth hoped. It is somewhat premature to express a definite opinion as to the outlook of the whole field, but developments at these two claims seem to indicate that there may have to be a re-casting of estimates in respect to the future of Broken Hill.

JOHANNESBURG, TRANSVAAL

Marriott's Square Fathom Scheme Criticised.— Mein Favors Old Basis.—Central Administration Returns.

Additional interest has been lent to the 'Tons r. Square Fathom' controversy through a paper by W. W. Mein, who has for some time past been general manager of the Eckstein's Central Administration group, which includes such important mines as the Robinson, Village Main Reef, Village Deep, New Modderfontein, and Ferreira. Mr. Mein vigorously challenges the accuracy of H. F. Marriott's remarks on the abuse of the per ton-milled unit, disputes the whole case brought forward in support of the square fathom basis, and argues that the system of recording results on the square-fathom basis instead of on the ton-milled as heretofore, and of issuing a statement as to the results secured per quarter instead of per month as heretofore, is from a practical point of view inapplicable to Rand mining. It will be recalled that a few months ago L. Reyersbach, of Eckstein & Co., when banquetted on the occasion of his leaving Johannesburg, threw out the suggestion that monthly returns should be superseded by annual returns. The suggestion raised a perfect storm of indignation in London and on the continent, and it was so patent that European shareholders were so strongly opposed to remaining in ignorance for months as to the performances of the mines, that the matter was dropped. But Mr. Marriott (who evidently came out here with full power and authority from the great firm of Wernher, Beit & Co.) has revived interest in this matter. He does not speak of yearly returns, but in certain usually well informed circles it is believed that the introduction of quarterly returns would be merely the thin end of the wedge in an endeavor to secure annual reports only. Mr. Mein's view is that it will remain obligatory for managements to maintain a detailed system of monthly records, "not only because of the large payments made monthly in respect to wages, but because any manager who did not make a close analysis of the position in the light of detailed records every month would be unable to exercise adequate control over changing conditions. His mine would get out of hand." It is common knowledge that for some time past the technical controllers of the Main Reef mining industry have been split up into two camps—the one side staking faith in the big mill, low-grade ore, and low cost policy, and the other favoring cleaner mining, the running of the mills to suit the mines rather than the reverse, and the recovery of a considerably greater amount of gold per ton although at a relatively high rate of expenditure. Of course the wisdom of each course has to be considered in special relation to each mine or each group of mines. What might be the best policy to pursue at one mine might be the worst for another. Those who have discussed the 'big mill' scheme with such denunciation that there is a strong insinuation of dishonesty in their criticism, have not been either just or considerate in their remarks. On the Rand are some of the best and most conscientious managers in the world, men who do their best to serve their employers, and I venture to remark that there is not a manager here today who is not doing his best in accordance with the policy laid down for him. Rand mining tendencies are not the outcome of policies devised at the mines themselves—not to any appreciable degree at any rate. Policies are thought out in London or the Johannesburg head offices, and it is the duty of the manager to abide by the method of working devised by his superiors. Should he believe that the scheme of operations devised is prejudicial to the mine he can of course raise his voice in protest, but in the case of a mine equipped with 300 stamps and where a policy of low-grade milling has been adhered to for some time, it is not always an easy matter to bring about a complete revolution of policy. It is worthy of note, however, that at the Robinson Deep there has been recently a reversal of policy. Rather than break ore in excessively wide stopes, 85 stamps out of 300 erected have been hung up and thoroughly adhering to a policy of cleaner mining, the returns of the company have been improved. When more labor is available the company will re-start the idle stamps. At the West Rand Consolidated, however, when confronted with a similar position a few months ago, it was decided to put machine drills in the stopes and run the mill on low-grade ores. Mr. Mein has striven hard for low costs and big tonnages, and in his

Central Administration Building Rand Mines.

paper he shows the following comparison between the years 1906 and 1908 for the mines of the Central Administration group:

	1906.	1908.	
	s. d.	s. d.	s. d.
Cost per ton milled.....	22 5	17 5	Decrease 5 0
Yield per ton milled....	38 10	37 5	Decrease 1 5
Profit per ton milled....	16 5	20 0	Increase 3 7

The increase in profit is £730,000, or exactly 50%. "This must surely be considered a beneficial result of the craze for keeping the full mill going, and greedily asking for more stamps," writes Mr. Mein. The paper is certain to evoke lively discussion. It would appear that the firm of H. Eckstein & Co. is not going to adopt Mr. Marriott's recommendations, not *in toto* at any rate. It is probable that in the annual reports of certain companies, a feature will be made of development, ore reserves, stoping, and driving on the square-fathom basis, and attention will be directed to these features at annual meetings. Apart from this, however, no change in policy seems likely in so far as the declaration of returns is concerned. In concluding his paper Mr. Mein makes the following summing up of his opinion of the agitation for the square fathom and the abolition of the working costs per ton milled consideration. "In bringing forward this new scheme Mr. Marriott has urged us vigorously to waste no time over the 'dead carcass' of working costs per ton milled. It is as dead, he tells us, as the proverbial door nail. Meeting metaphor with metaphor, I will, in conclusion, merely risk the prediction

that the new fathomage test of mine values and deformities are recognized by those endeavoring to get upon its feet will be found unable to bear the burden of its full responsibilities and will pass its frail existence furtively and impotently riding on the back of the unprotected ex-cass of the tonnage system.

SEATTLE, WASHINGTON

Gold Receipts. — Mining in the Cascades — Tacoma Smelter — Alaska Mines —Stewart District

The gold bullion receipts from Alaska at the U. S. Assay Office at Seattle for the fiscal year ended June 30 1910 were as follows: Nome district $4,167,501; Fairbanks district $5,076,177; other districts, $918,744; total, $10,162,422. As some shipments from Alaskan points were made direct to San Francisco the above figures fall considerably short of representing the aggregate value of gold bars and gold dust sent out of Alaska for the year. Further figures show that between July 15, 1898, and July 1, 1910, Nome has sent, in round numbers, $42,000,000, Fairbanks $37,000,000, and other Alaskan points $8,000,000 to the Government assay office at this place.

The neglect of the Cascades in western Washington as a metal mining country has been due in part to alluring placer goldfields in Alaska to which Seattle men have been going for more than a decade. That some promising veins of copper, silver, lead, and gold ores have been opened in these mountains seems beyond question, yet Seattle men do not take readily to exploration in this rugged and heavily wooded range while the ships ply between here and the frozen streams of the Far North. Reliable reports of a mining engineer who recently visited Wenatchee, in Chelan county, vouch for the discovery in that vicinity of a gold bearing zone of quartz and rhyolite more than 200 ft. wide, which samples $2 per ton, the gold occurring free. This is one of numerous examples of worthy prospects in the Cascade mountains. While mining operations in the Cascade range, in Washington, are not aggressive, conditions in the Northwest generally are hopeful and healthful. While few enterprises are being promoted and there is but little life in the mining stock market, there is a considerable amount of development going on; and the shipments of ore to the smelters at Tacoma and Ladysmith demonstrate that the active mines of the Northwest are keeping up and in some cases increasing their production. The Tacoma plant is receiving about its usual tonnage of lead-silver ore and concentrate from the Coeur d'Alene district; it is receiving a considerable part of the 4000 tons per month of silicious ore mined in Republic district. The ores produced on Texada island, British Columbia, amount to a considerable tonnage, the principal mines being the Marble Bay, Copper Queen, Cornell, and Little Billie. These ores consist of a copper sulphide, accompanied by some gold and silver. The La Touche mine, situated on La Touche island, in Prince William Sound, Alaska, has been taken over by the Beatson Copper Co., which purposes developing on a greater scale and increasing its shipments of copper ore. It is also understood that the Ellamar mine, in the same part of Alaska, is to begin ore shipments in August, or as soon as the coffer dam, now under construction, shall be finished. The ores produced on Prince William Sound are shipped mostly to Tacoma, while those mined on Prince of Wales and Texada islands are divided between Ladysmith and Tacoma. The shipping mines on Prince of Wales island, near Ketchikan, are the Sulzer, Mt. Andrew, It, and Goodrow, with others developing. The Dunton mine, at Hollis, on this island, produces gold ore which is milled on the ground, the owners being M. K. Rodgers and associates of Seattle. The others mentioned yield ore having a copper-iron base, carrying other metals.

Interest in the Stewart district, situated at the head of Portland canal, is reflected in the activity at Vancouver, British Columbia, by way of organizing companies to acquire and develop mineral claims in that district. An engineer who had visited Stewart to look over the country stated that the indications were good, but that everything was very new as to development.

ELY, NEVADA

Nevada Consolidated — Nevada United to Issue Bonds — Ely Calumet — Ely Goldfield Railroad

Notwithstanding the low price of copper there has been no abatement in the output of the Nevada Consolidated. In fact every month since March has shown a record. In course until the output is now running well above 6000 tons per month. On July 9 202 cars of ore averaging 55 tons each were shipped from Copper flat to the concentrator making a total for the day of 11,165 tons. The general average of the month so far has been considerably in excess of 9000 tons of ore per day which if kept up for the remainder of the month, will prove a new record for the camp in the production of copper. Another pleasing feature from a local viewpoint is the fact that an official statement issued by the company places the cost of production for the month of May at 5.95c per pound. This, for a company that has been making copper but two years is certainly a revelation to other and older producing companies, and will go far toward establishing the supremacy of the porphyry copper mines. It proves that the Nevada Consolidated is now on an earning basis of $4,800,000 per year. It is paying dividends at the rate of $3,000,000 per year, which can be increased 50% on the present price of copper.

It may now be considered as a reasonable certainty that a railroad will be constructed during the present year from Ely to Ward, twenty miles south, to connect the mines of the Nevada United company with the Nevada Northern railroad. The company has a million and a half tons of lead-silver ore blocked out in its property which will average about 25% in lead and from $8 to $15 per ton in silver. The shareholders of the company at a meeting in Denver voted to issue bonds for a sufficient sum to build the road and equip the property with an aerial tramway and ore-bins. A preliminary survey for the road was recently made by the company, which is being checked over by engineers who are supposed to represent the Nevada Northern railroad. Mr. Berry, of New York, an engineer who is a subordinate to Pope Yeatman, consulting engineer for the Nevada Consolidated, is also at the property checking up the tonnage blocked out in the mine. H. Byrd Northrop, treasurer of the company, who resides in Denver, has been at the camp for the past week, and is assisting the engineers in their work. Two years ago the Nevada United company shipped 30 or 40 carloads of ore to the Denver smelters, from which it received a most satisfactory return, but as the wagon haulage from the mine to the railroad amounted to $4 per ton the management decided to defer shipments until it could secure the construction of a railroad, and apparently the time has now come for its construction. Development work has been continued steadily since that time.

C. S. Herzig, consulting engineer for the Ely Central, is spending the week here and is well pleased with development since his last visit. About four weeks ago a find of considerable importance was made on the property of the Ely Calumet company by lessees. The drift has been driven along the lead, which is 3 ft. wide, for a distance of 40 ft., and samples of the ore show that it contains 25% copper. Near the face of the drift a winze has been sunk 10 ft. from which 30 tons of ore were taken which samples as well as that in the drift. This is the richest ore found in the district, except that taken from the 1200-ft. level of the Giroux. The property is situated immediately north of the town of Ely and is on the extreme eastern end of the copper belt. The formation is principally limestone overlying monzonite to a depth of several hundred feet, and is traversed in an easterly and westerly direction by fault fissure veins, showing quartz and iron outcroppings in many places. The veins have been crushed and brecciated between the walls of limestone, making it possible for the mineral solutions to penetrate and precipitate the metals in the softer formation of the fissures. The eastern end of the belt has been neglected for years by mining men, who were of the opinion that the limestone did not contain cop-

per deposits of importance. The company, it is announced, will open its entire property, consisting of 28 claims, for leasing, and as good ore is showing in many places on the surface it is likely that many lessees will soon be at work on the company's ground. The first payment of $10,000 was made July 9 by S. Herbert Williams and Harry Eastwood on the Turner Ely group of claims upon which they recently secured a bond. The property lies immediately south of Lane City, two and a half miles west of Ely, and is considered as one of the best steam-shovel propositions in the entire district. The sulphides in many places crop on the surface, and it is said by men familiar with the property that they will average from 8 to 12%. It is the intention of the present owners to commence development work on the property in the near future.

It now seems probable that the long talked of Ely-Goldfield railroad will be a reality in the near future. It is known that F. M. Smith has recently returned from Europe, and he has announced that the road has been financed. A permanent survey for the road was made last year from Cuprite, fourteen miles south of Goldfield, to Ely by way of Tybo and Current creek, but it is now thought that the road will run nearly directly north from Tybo to Hamilton, with a branch west of Hamilton to Eureka, which has been without a railroad since the washing away of the Palisade-Eureka road in March last, and which so far there has been no effort to rebuild. Eureka and Hamilton are two of the largest tonnage camps in the State. The mines at Eureka are owned by the United States Smelting company, the ores from which have been shipped to the company's smelter at Salt Lake at the rate of 200 tons per day. The ores are lead-silver bearing and are greatly in demand at the smelter for flux. It is thought that the delay in the reconstruction of the old narrow-gauge road from Battle Mountain has been largely due to the probability of the early construction of the Ely-Goldfield road, which would give the camp of Eureka a standard gauge road, and thus do away with transferring the ore at Battle Mountain.

ST. PETERSBURG

New Oilfields. — English Investments. — Lack of Order. — Quality of Oils.

The following statement of the position of matters as between the people of this country interested in oil either as investors or speculators and the petroleum industry in the Kuban region is one containing not only statements of quite well known facts, but also showing the way that must be followed if the Kuban petroleum industry is to issue from its early stages into a developed business and avoid the checkered and frequently disastrous experiences through which Grozny, with remarkable richness in petroleum, has had to pass up to its present position of relative prosperity. Grozny is nearer the Black Sea than the Caspian, and finds its most convenient port in Novorossisk, that is to say, it is a Black Sea petroleum area, and more than once in its history black ruin has stared the petroleum producers there in the face. Subsequent to, and not unlikely because of the extraordinary troubles at Baku in 1905 which caused petroleum to rise to a phenomenal price, Grozny has lately developed its resources and during the last few years has achieved record productions, reaching now to over 50,000,000 poods per annum, or over 10% of the total Russian production of petroleum.

The Maikop petroleum deposits have the advantage of being still closer to the sea, and therefore within easier reach of the world's market. The operators will probably not have to go through the experience of the Grozny people, whose struggle with water caused heavy loss as well as legal proceedings, but if the business is to develop on healthy lines it must go out of the hands of the speculator and into the control of the investor and the expert. At Maikop claims have been bought and sold without any regard to their value, and it has been quite a common thing for both buyer and seller to be quite unable, after important sums of money have changed hands, to indicate the spot that had been dealt in. Both last year and the present one will ever remain memorable in the history of the Russian petroleum industry because to the interest taken in petroleum deposits to be found in the Kuban Province. Properly speaking, at the beginning of the excitement over this business it was simply a question of the so-called Maikop region which is situated to the south of Kuban, but the petroleum gusher which was struck in the early days of September last year in the Maikop region so stimulated general interest in petroleum that people began to seek for it in the northern part of the region as well. Then finally petroleum searchers covered the whole of the Kuban Province from the Maikop field in the south to the lower courses of the Kuban and Taman in the north.

The result of this movement of interest in Kuban petroleum at the present moment is that the charts of allotments over the area present the feature of a chess board; for there is hardly throughout the whole Kuban Province a single spot of ground where some enterprising man or another has not placed his sign-board or claim, while in the vastly preponderating number of cases he has not taken any time to inquire whether his claim may or may not be on petroliferous land. Without the slightest exaggeration it may be said that now the Kuban Province is covered with a thick forest of claim 'pillars' and it is unfortunately to be stated that in a whole series of cases such claim pillars have brought solid profit to those who have fixed them. Finally those persons who have acquired money in this way find themselves in a favorable position for the moment, but this success must doubtless be considered as placing something of a burden on the future of the Kuban petroleum industry. It is, for example, only recently that news has come from London that the English have considerably cooled in respect to the Maikop petroleum business and they do not wish to hear more of the Maikop claims. Such an indifference toward Kuban petroleum on the part of English capital is quite easily understood. In a great number of cases English investors have had offered to them quite worthless sections of land and their valuelessness is a question both of geological formation and of legal rights. To calculate exactly how much capital has been invested up till now by the English in the Maikop business is impossible; but there are indications that the nominal amount so invested has reached something like 200,000,000 roubles ($106,250,000). According to the list of registered companies in England the capital paid in is less, somewhere between 60,000,000 and 100,000,000 roubles. But whatever sum has to be deducted from the above figure we must recognize that the balance is large. How far such capital is genuine is another question, and in this respect we must recognize that in the cooling off of English investors in the Maikop business Russian unprincipled 'claim stakers' are guilty besides many English dealers who, having considered the business from a purely speculative point of view and having formed such companies, were ready to undertake anything profitable excepting the production of petroleum in Kuban. Up to the present time at least, notwithstanding the undoubted transfer into English hands of a large area of the Kuban Province, very little is heard of serious work undertaken with the object of obtaining petroleum, and even in England in the reports of several companies which have appeared for the exploitation of petroleum in Kuban, we find only information of the revenue of these companies obtained by the issue of fresh shares and so on, which is a purely stock exchange operation. Thus, for example, we find the account of the general meeting of the shareholders of the Maikop & General Petroleum Trust, Ltd. in which the directors very elaborately dwell on these revenues which they have realized, having formed (although their own company has scarcely come into existence) four new companies, the Maikop Valley, the Anglo-Maikop Corporation, the Maikop Producers' Co., and the Maikop Mutual Oil Transport Co., while as to the existence of reserves of petroleum on the allotments of the respective companies or as to boring and general work very little indeed is said in the report referred to.

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With reference to this matter I do not take upon myself to throw discredit in any way on the solidity of the said company, nevertheless the domination in that report of the stock exchange operations over the genuine work on the spot is in any case unhealthy. To us Russians it is impossible to forget that petroleum in the Kuban Province has been known for a long time. For example, in Kudako on the Iska there was once obtained a good quantity of liquid mineral, nevertheless the Kuban petroleum industry did not develop, but came to an absolute stop. As in the case of Kudako so also in that of Iska the opinion is that both these concerns terminated unfortunately because they were not exploited in the proper way and hence no doubt the conclusion follows that the deposit of petroleum, in the Kuban Province is characterized by experts as possessing specific peculiarities with which, everyone who contemplates boring for petroleum there, must take account. That is why the English companies which desire chiefly to turn their attention to speculation on the Bourse and only partly, so to speak, among other things to deal energetically with work on the spot were early consigned, if not to destruction, at all events to heavy loss, and this fact no doubt influenced the disposition generally of English capital in Russian business.

It should be noted that Kuban oil compared with other petroleum is distinguished by a high content of benzine, a point which, thanks to the development of motoring and aviation, grows in importance day by day. The Kuban petroliferous region will serve for the export of petroleum products from Russia but not by any means for the flooding of the Russian market with petroleum products, and this circumstance should be remembered by the Baku and Grozny petroleum firms which, as it is alleged, have just secured allotments at Kuban, but do not contemplate the development for fear of future competition. Such a view cannot under any circumstances be considered correct, and on the contrary it would appear to Russian petroleum firms acquainted with local conditions that they should be at the head of those enterprises which either have already begun serious work in the production of petroleum at Kuban or contemplate doing so.

In the Government town of Ekaterinodar, applications for claim certificates are being made every day and the administration is quite unable to grappel with them all. One reason is a shortage of employees in the mining office and there is also a lack of hands for marking off allotments, the issue of which takes months instead of days which would be the normal period, and cases are cited in which agreements respecting these take over a year in preparation. As a consequence much money is being sunk in machinery and tools besides wages, and for want of a solid agreement petroleum production is delayed. A considerable number of allotment holders, representing 400 sections in all, have specially petitioned the Government to have this unsatisfactory state of affairs put straight. To anticipate the decision of such questions of principle is not my province here, but I must observe that the promptest solution of them as well as the promptest possible reply to various kinds of documents that reach the Government appears of primary and essential importance for the petroleum industry that is to develop in Kuban.

Exact statistics of the petroleum output up to December 1, 1909, give a total of 449,580,000 poods (poods = 36 lb.), as compared with 433,180,000 poods for the corresponding period of 1908, making an increase of 16,400,000 poods of raw oil for the 11 months, which is to be attributed exclusively to developments in the Bibi-Eybat district. In all the other districts the output has receded.

NEW YORK

Silver Price Advancing — New Enterprise in Mexico — Expensive Litigation in Mexico — Western Mining Shares on New York Stock Exchange — The Coppers — Utah Copper's Great Output.—Hill Wants Lower Copper

The improving price of silver is the bright spot in mining circles in the East. Boston is primarily a copper centre, especially of the Lake producers. These have suffered with other copper shares. The development companies opening Mexican properties and the shareholders in such enterprises are most largely interested in the growing demand for silver. A 55c silver market will mean much for many Mexican mines. The development of the immense low grade orebodies of the Mexican mines appeal to the average Eastern investor more strongly than the continual prospecting for new veins in Cobalt. A further advance in silver will mean profit for many mines which have been just paying expenses. The interest in Mexico is growing throughout the East, although the promotion of new enterprises is almost at a standstill. One of the most recent of important organizations formed to exploit Mexican mining properties is the Mexico Orient Mining Syndicate, a development company formed by Arthur E. Stillwell. The new development company is to operate in Chihuahua and Sinaloa, along the line of the new road. English capital has been enlisted, and the Mining Syndicate has been organized as an English corporation with a capital of £125,250.

Samuel Untermeyer, of the New York bar, who is credited with having received a fee of $800,000 for effecting the Utah Copper-Boston Consolidated merger, will have to look to his laurels. In a recent decision by the courts of Mexico City, in a suit brought by the Mine Development Co. against George D. Barron, president of the company, and also president of the Tezuitlan Copper Mining & Smelting Co., the attorney for plaintiff was awarded a fee of P2,302,500, which overtops Mr. Untermeyer's last triumph. Mr. Untermeyer has in hand the merger of the La Rose, Nipissing, and Kerr Lake of Cobalt, and in this deal will lie his opportunity of going once more to the head of his class. The judgment against Mr. Barron involves the sale by Barron of the properties now operated by the Tezuitlan Copper Mining & Smelting Co., for $11,529,542, so that the enormous fee awarded was in reality about 10% of the judgment. New suits based upon the finding will probably be brought against the present Tezuitlan Copper Co., the Mexican corporation.

The successful development of the rich orebodies of the Tuolumne Copper Co., at Butte, has been carried forward under constant possibility of legal complications with the North Butte Copper Co. The matter finally culminated in a suit started by the North Butte which at the outset prayed to enjoin the Tuolumne company from further work. The request for an injunction was finally withdrawn and a quieting of title in a fractional claim and an accounting asked for. This will give both sides a chance to be heard.

One of the whimsicalities of the sentiment which rules the market is the failure of the rise in silver to add in the least to the activity of the Cobalt market. As a mining camp Cobalt is busier than ever; the rise in silver has meant a large increase in the profits from Cobalt properties, but the public has ignored this phase of the situation. Many of the pioneers in Cobalt have gone to Porcupine. Recently D. Lorne McGibbon, president of the La Rose, and a member of the Nipissing board, has become interested in Porcupine, as a member of a syndicate taking over a group of seventeen claims, known as the Dobie property. The purchase of a controlling interest in Nevada Hills by a syndicate, headed by H. C. Frick, of Pittsburg, and J. H. Carstairs, of Philadelphia, is taken to signify that the mine has been developed into a property of greater promise than the public had been led to believe, and also that Nevada Hills will become the leader of the Nevada precious metal share market which with Goldfield Consolidated is transferred to the New York Stock Exchange. It is true that in a sense the listing of mining stocks upon the New York Stock Exchange is a recognition of standing, but in every

instance market activity in the various stocks has soon languished. Until the New York Stock Exchange changes its attitude toward mining investments, such issues as procure admission there, will continue to find themselves in a hostile atmosphere. Goldfield Consolidated has enjoyed strong support and an active market on the curb assisted by arbitrage business between New York, Goldfield, and San Francisco. The arbitragers will cease to trade when the shares leave the curb, and like Nevada Consolidated, Goldfield Consolidated will soon have a market of but a few shares daily. Tonopah is making a strong bid also for a revival of interest due to development in the Tonopah-Belmont. A report to the directors at the July meeting is expected to show that net profits for June exceeded $100,000. Ely Consolidated, recently boomed to above $1 per share, has levied an assessment of 5 cents per share. The company naively states that money is needed for salaries and development work. It is only a few months since announcements were made in the press that the property had been proved a big mine. The assessment has caused a market shrinkage of about 80%. The annual meeting of the Silver Mines Exploration Co. was held in New York this week. This is the Lewisohn organization which handles operations in Kerr Lake, Wettlaufer, and other Canadian properties, and will probably be the holding company through which the San Cayetano at Guanajuato will be developed.

The copper situation remains unchanged, the only matter of importance being the market shrinkage of Amalgamated. An issue paying but 2% could hardly be expected to hold its own in a falling market and the anomalous position occupied by Amalgamated has been a matter of comment for some time. Under heavy selling the stock sold off to 57 and students of the copper market consider it still too high. The Granby has started three diamond drills to prospect a part of the company's unexplored territory. Officers of the Granby maintain their reticence, and shareholders are without official information regarding property conditions. At the annual meeting in October, a statement is expected, and it is rumored also that resignations of J. Langeloth, president, and B. Hochschild, vice-president, will be tendered. Lake Copper, another Boston issue, which enjoyed much notice about the first of the year, and sold up to 94½, has been causing shareholders much uneasiness by its market shrinkage, 32 having been reached during the past few days. The slump is attributed to a falling off in value of the ore. Present milling operations show the ore to run 21 lb. copper per ton. The Raven Copper Co., also a Boston copper, has levied an assessment of 10c. per share. F. Augustus Heinze, now in Europe, in an endeavor to sell the $750,000 of bonds of the Ohio Copper Co., has evidently found it uphill work. He states that the timber lands of the United Copper Co., in British Columbia, will probably be sold to English capitalists; this will put the United Copper Co. in position to take the Ohio bonds and advance the money needed. While assessments are falling about the ears of shareholders, and the copper surplus is increasing, and James J. Hill is advising the selling agencies to make a price that will put the high-cost coppers out of the running, the situation has some good features. The Canadian Pacific is to string 2400 miles of copper wire between Montreal and Vancouver. It would not take many such orders to ease the burden of the copper surplus. The Ortega Mining Co., of Cananea, is being once more reorganized. The Ortega, the Miller Mining Co., the Corregidor, the Red Cloud, the Chapultepec, and the Cia. Minera Cuño de Plata, most of which properties were formerly a part of the Southwestern Mining Co., and later organized into the Kansas Cananea Copper Co., are being reorganized into the Arizona-Cananea Mines Corporation. The properties aggregate 4202 acres, part of the ground adjoining the Greene-Cananea. The mine management is to be in the hands of John T. Morrow, formerly general manager of the Greene Consolidated. There has been $400,000 expended in the development of the properties. The present management plans to open the ground for a production of 2000 tons per day, and erect a plant like Greene-Cananea to handle this output. Copper costs are estimated at 9c. The new interests in Nevada Hills have plans under way for the erection of a 100-ton mill, including the foundation for a second section of like capacity.

TORONTO, CANADA

Cobalt Shipments.—Gowganda, Porcupine, and Great Pike Lake.—Iron Ore in Quebec.

The physical condition of Cobalt was never better. The output has lately been well maintained and numerous good finds have been made. A record bullion shipment was made on July 12, including the initial consignment from the new cyanide plant of the Nova Scotia of 26 bars, and 35 bars from the O'Brien. The two lots contained 60,200 oz. pure silver. The Hudson Bay will put up the fourteenth concentrating mill of the camp, which will have 20 stamps and a capacity of about 80 tons of ore per day. The Crown Reserve has issued a statement for the first six months of 1910 showing shipments valued at $709,569, operating expenses $109,644, and royalty $63,861, leaving profits of $536,064, of which $530,644 has been paid in dividends. At the Little Nipissing the winze on No. 2 vein has been sunk to a depth of 75 ft. from the east drift on the 155-ft. level and will be put down 50 ft. farther. At the present bottom of the winze No. 2 and 4 veins unite forming a large and rich orebody. On the Cobalt Lake property some fine showings occur in the north drift from the west cross-cut at the 280-ft. level. The vein, about 3 in. wide at this point, contains an important amount of silver. The Wyandoh, in the Gillies Limit, recently made its first shipment, comprising 24 tons, over half of which was high grade. A new vein was lately uncovered south of No. 1 and cross-cutting is in progress to reach this and several other veins, which show well on the surface at depth. The Rochester has sent a 10-ton shipment of ore taken from a new vein on the 75-ft. level, to the new sampling plant of Campbell & Deyell at Cobalt. A new and rich vein has been found in the Lawson property of the La Rose Consolidated on the west corner of the lot. Surface development on the Nipissing has resulted in the discovery of a 4-in. calcite vein, which will probably run high grade, and has been traced for 30 feet.

The Millerett, Gowganda district, has been a steady shipper for some months, having sent away 283 tons this year to date. The control of the Bartlett mine in the same district has passed into the hands of a syndicate headed by J. R. Carter, and operations are to be resumed at an early date.

The funds will be raised by the sale of 300,000 shares of treasury stock, which will be taken up by the large holders at 25c. per share. The main shaft is down 150 ft., but the vein has dipped away from the shaft and driving will have to be done to reach it. In South Lorrain the Keeley has cut a 12-in. vein of smaltite and native silver on the 100-ft. level. The Kittie near Loon lake, operated by the Howard Syndicate, has struck a vein 7 ft. below the surface carrying 300 oz. silver. The Montreal Reduction & Smelting Co., which built a smelter at Trout Mills near North Bay for the treatment of Cobalt ores, is in process of liquidation, and the plant which cost $275,000 and was never operated, is offered for sale. Many prospectors have gone to the country around Great Pike lake, situated about 40 miles southwest of Porcupine, the trail from that point leading down the Matagami river. The rocks in this area are granite and schist, and gold has been found in quartz veins and stringers at the contact of these rocks.

Samples brought to Porcupine show free gold. B. Lorne McGibbon, president of the La Rose Consolidated, and Frank Armstrong, have taken over the Bruce claims in Porcupine comprising 17 locations. The Mines Branch of the Canadian Department of Mines has drawn attention to the existence of an iron orefield 90,000 sq. ft. in area, about 4½ miles from Chat's falls, Pontiac county, Quebec, which was practically unknown. The ore is reported as being suitable for concentration for iron manufacture by either electric or blast-furnace.

General Mining News

ARIZONA

COCHISE COUNTY

The shaft of the Denn Arizona at Bisbee is down [illegible] ft below the 1350 ft level in a hard limestone. Three drifts are being driven on the lowest level and some rich copper ore opened.——A new steel head frame has been completed at the Hoatson shaft of the Superior & Pittsburg Copper Co. and the greater portion of the output from the mine is now being hoisted through that shaft. Sinking has been discontinued at the 1300 ft level of the Briggs shaft and a station is being cut at that point.——A gasoline hoist has been installed at the White Tail Deer shaft of the Copper Queen Consolidated Mining Co. and sinking continued at a depth of 45 ft.—John Korp and associates, operating a lease on the Wolverine, shipped a carload of lead silver ore to the El Paso smelter.

GILA COUNTY

(Special Correspondence.) The first two churn drill holes sunk on the property of the Cactus Copper Co., several hundred feet northeast of the Hamilton shaft where nearly all the development has been done, met heavy flows of water but no copper bearing schist. These holes were not put down in the expectation of finding ore, but for the purpose of proving that no ore underlies this part of the property, where the main working shaft will be sunk in the near future. The first hole attained a depth of about 500 ft. and the second hole was abandoned about 260 ft from the surface. The drill is now working in the bed of Pinto creek, about 600 ft. southeast of the Hamilton shaft.——A Sullivan 2¼ in. diamond drill on the 650 ft. level of the Superior & Globe mine has been in operation in diabase for the last two days.——Construction on the surface plant of the Miami Copper Co. is making rapid progress under the direction of H. Kenyon Burch. The old shaft-house at shaft No. 4 has been torn down and a new one is to take its place. The two Nordberg hoists, one for the man-cage, the other for ore hoisting, are on the ground ready for installation. A raise is now being put up on churn-drill hole No. 6.——The churn drill at work at the Warrior is now developing the Dadeville claim and is at a depth of 475 ft. in schist.——The diamond drill formerly in use at the property of the Superior & Boston Copper Co. is now being employed underground on the seventh level of the Arizona Commercial mine.

Globe, July 15.

MOHAVE COUNTY

C. E. Price has secured a bond on the Kimball group on Bill Williams fork and put a force of men on development work.——Development on the 100 ft. level of the Golconda opened a shoot of rich ore at a point in the vein that was thought to be barren.——A crew of the Needles Smelting & Refining Co.'s engineers is making a preliminary survey for a branch track from the end of the line at Chloride to the Tennessee mine which the company is working under lease and bond.——The Tracy Engineering Co. is to add another unit to the power plant at Kingman, increasing the capacity 50%. There has been a constantly increasing demand in the district for electric power and the company will probably add four more units within a short time.——The Frisco Mining & Development Co. has installed an automobile truck to carry freight to the mine.——A new hoist and pumping plant has been ordered for the I. X. L. mine near Stockton hill.

YAVAPAI COUNTY

The Tip Top Heath Mining Co. which is opening the old Tip Top mine in the southern part of the county to obtain the tungsten ore that was left in the mine by the former operators, has cut a body of silver ore, samples from which assayed 1000 oz. silver per ton.——The Jerome-Verde Copper Co. has completed the installation of the new machinery and will unwater the shaft.

YUMA COUNTY

The churn drill operating on the Planet property cut a body of native copper at a depth of [illegible] ft. Rich samples of copper ore have been taken recently from the drift on the 40 ft. level of the Sweeney group in the Little mountains.——A churn drill has been taken to the Horn property near Grammett on the Parker cut-off and will soon be started to prospect the ground.——W. E. Scott who is operating the Goodman mine in the Quartzsite district is treating the high grade ore in the small stamp mill on the claims and is planning to erect a larger plant in the near future. There is 18 in. of high grade material and about three feet of ore that will assay $7 to $10 per ton.——The Interstate Gold Dredging Co. has enlarged its plant to bring the capacity of the rest of the plant up to that of the steam shovel.

CALIFORNIA

INYO COUNTY

A 4 drill compressor has been hauled to the Casa Diablo mine and is now being installed. The shaft is 310 ft deep and will be continued to the 400 ft. point where a station will be cut and lateral work started on the vein. The company shipped a $3000 gold bar about the first of the month.——F. B. Remington, Samuel Musser, and William Cahoone have shipped a cyanide plant to Benton and will install it at the Edwards ranch, which they secured some time ago. It is estimated that there is 15,000 tons of tailing from the old Commanche mill on this ground from which assays as high as $14 per ton have been obtained.

MARIPOSA COUNTY

William Dusel has opened a shoot of $150 ore on one of the claims in the old Teats group at Whitlock which the Dusel brothers secured some time ago. Over 2000 ft. of development has been done since the mines were acquired and the operators now have 60 tons of high grade ore on the dump.

NEVADA COUNTY

J. E. Wise and E. Edwards are to incorporate a company to operate the Richmond and Gold Line claims near Moores Flat in which they are interested.

PLACER COUNTY

The drift at the Big Dipper near Iowa Hill has opened a rich bed of gravel and the force at the mine has been increased to 50 men.——Work at the Dewey which has been suspended for some time on account of the lack of pipe, has been resumed.——R. H. Young has resumed work at the Annie Laurie mine and will develop the shoot that was opened in the shaft two years ago.——Six men are working in the adit at the Good Friday mine at Ophir, and a vein of fair ore has been opened.

SHASTA COUNTY

F. H. Dakin, Sr., president of the Virginia Gold Mining Co., has commenced work at the Uncle Sam mine back of Kennett following the surrender of the option on that property which was held by the Hazel Gold Mining Co.——The smelter town of Winthrop was destroyed by fire though the smelter which is situated a short distance from the town was uninjured. The loss is estimated between $75,000 and $100,000 of which about two-thirds was covered by insurance. Though the smelter of the Bully Hill Mining & Smelting Co. was shut down the first of the month, work has been continued in the mines of the company and a small amount of ore shipped to the Coram smelter.

SIERRA COUNTY

Work has been resumed at the Sixteen-to-One mine in the Alleghany district which has been shut down for the past few months on account of litigation. H. L. Johnson, owner of the Tightner, will be manager for the reorganized company.——Work is to be started at the Runyan group in Hungry Mouth ravine.——The boilers at the Bear Creek mine near American hill have been fired up as the water supply has become too low to operate the two-stamp mill.——The contractors who are driving the adit at the White Bear to drain the lower end of the Monte Cristo property

are reported to be making good headway although the rock is quite hard.——The shaft of the Poker Flat Mining Co. is down 275 ft. and has 40 ft. farther to go before the gravel is opened.

SISKIYOU COUNTY

The Yellow Rose mine situated near the border of Siskiyou and Trinity counties will resume development this fall. All work will be done from the lowest adit which is in 1200 ft. and 650 ft. below the apex of the vein. It is the intention to drive a 340-ft. raise to connect with a winze that was sunk on the ore some time ago.——The Wellman dredge is running steadily at McConnell Bar and the clean-ups are said to be satisfactory.——The Van Brunt mine is running two shifts but will shut down for the season in a short time. ——Operations are to be resumed at the Frazier-Gibson mine below Happy Camp as soon as the fall rains commence.

TRINITY COUNTY

The lining of the tunnel of the Trinity River Mining Co. near Lewiston collapsed and work has again been temporarily suspended. This is the third time the company has been on the verge of starting only to be set back by some accident.——Work has been resumed at the Golden Jubilee mine near Carrville which has been idle for a long time.—— After a long period of inactivity the Wagner has resumed operations and the management is meeting with good success. The drift which is being driven on the vein has opened a shoot that assays in the neighborhood of $70 per ton.——At the Dorleska the mill is running on ore from the dump and development is being carried forward in the mine.——The Poverty Slide hydraulic mine at Trinity Center, has been shut down for the season on account of the lack of water.——The Van Ness is sinking a shaft from the adit-level to explore the vein.——The Blue Jay mill which is equipped with a concentrator, crusher, and Pelton wheels to furnish power will be started in a few days.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence).—A streak of ore 10 in. wide has been uncovered in the west drift of the fourth level of the Smuggler mine on Brown mountain. From a shipment of 10 tons made last week a return of $110 to the ton in silver and lead was realized. The shaft is to be sunk another 225 ft., levels to be started from each 75-ft. station. ——Shipments of ore have been started from the True Fissure property, the product being sent to the Golden pyritic smelter. The ore is being taken from the west drift of level No. 6. Willis Bristol is manager.——The foundations for the 100-ton mill at the Conqueror mine have been completed and a force of carpenters has been put to work constructing the building. Machinery has been ordered and will arrive the latter part of this month. W. S. Pryor is manager.——The Ophir Mountain Mining Co. has taken a lease and bond on the Kentuck mine on Bellevue mountain. Operations will be carried on through the Central adit.——A compressor plant has just been placed in position at the Blue Bell property on Seaton mountain. Development is in progress and ore is being broken to supply the new 50-ton mill.——Shipments have been started from the Cumberland property at Alice, the product being sent to the Golden smelter. A carload of ore was shipped last week from the Princess Alice mine to the Golden smelter.

Georgetown, July 16.

GILPIN COUNTY

(Special Correspondance).—Work has been started in the construction of a 25-ton mill at the property of the Golden Sun Mining & Milling Co. J. L. Gordon, the manager, states that dynamos have been ordered and that the adit workings will be electrified.——It is understood that the International property on South Boulder creek is to be equipped with a 25-ton milling plant.——A 6-in. streak of smelting ore has been uncovered on the Grace property that is worth $32.80 per ton in gold and silver. The property is situated in Russell district and is a new prospect. ——Heavy shipments are being made from the Smuggler property. All of the product is being treated at the company mill. G. M. Ashmore is manager.

Central City, July 15.

LAKE COUNTY

The amount of work at present being carried on in the Leadville gold belt district surpasses that of any previous year, and is not being confined to where the known ore-shoots exist, but is being carried into new territory toward Mosquito range and Prospect mountain. Since the opening of the summer season three new shafts have been started in this part of the district, the Little Mary, Famous, and Fourth of July. The two former are situated in Big Evans amphitheatre and are close to the Dolly R., both claims having been unwatered by the Yak tunnel.——The owners of the St. Louis mine have secured a lease on a 750-ft. block of ground on the north end of the Fanny Rawlings mine, and at present are retimbering and putting the shaft in good order. The property has been unwatered, and when the repair work is completed operations will be started.——Good progress is being made in driving the Alps-Aztec adit toward the head of Little South Evans gulch. The breast is now in 530 ft., but the operators have several hundred feet yet to drive before the objective point is reached. While driving the adit numerous small veins have been cut.

OURAY COUNTY

H. P. Foley while driving a cross-cut from the shaft of the Carbonate Queen property near Ironton cut a 12-in. seam of galena ore that assayed 40% lead and from 60 to 100 oz. silver per ton.——It is reported that operations are to be resumed at the Savage Bear in the Bear Creek district at an early date.——J. P. Lang is shipping high-grade copper-silver ore from the Morning Star property.

SAN JUAN COUNTY

The eastern gold belt of San Juan county is again to the front with a find of exceptional value in the Tiger mine, level D. The Iowa Tiger is leased to the Iowa Tiger Leasing Co., made up of local merchants and mining men. For the past 18 months they have been mining a lead ore without any knowledge of the rich gold along side of it. It was noted that by throwing more ore into the mine run from the Tiger, the gold value in the concentrate ran up to one or two ounces per ton. The reason for this was shrouded with mystery until very recently, when prospecting the hanging wall disclosed minute stringers of what appeared to be iron pyrite in the candle light. On bringing this to the surface, however, it was found to be free gold. At lot of 2800 lb. has been shipped to Silverton, the first assay of which ran 62 oz. in gold. The extent of this occurrence is not known as the stope is filled with ore below and not mined out above. This is a repetition of the discovery in the Camp Bird mine where the galena was thought to be the pay-streak and Thomas Walsh afterward found the gold value in the hanging wall. It is reported that Louis Quanstrom, foreman of the mill, is the one to have made the discovery.

SUMMIT COUNTY

The lessees of the Jumbo mine in the Breckenridge district, have got the property in good order and are opening several shoots of free-milling ore.——The aerial tram at the Arctic has been completed and the mill will be started in a few days.——Money has been raised to build a large mill to treat the ores from the Peruvian and Shoe Basin mines and construction will soon be under way.——The Rothschild is expected to resume work in the adit shortly.

TELLER COUNTY

The compressor from the Golden Wedge mine in the Cripple Creek district has been moved to the Dollie Varden by the lessees.——J. T. Keller and associates operating a lease in the Callie mine have opened the extension of the Hodges vein and are shipping ore that assays as high as five ounces in gold per ton.——The Vindicator Mining Co. will pay a dividend of three cents per share on July 25 which will total $45,000.——The Cresson has completed the installation of the big first-motion hoist and resumed work. ——Sub-lessees operating on the eighth level of the Mabel

M claim have opened a shoot of $100 ore. A churn drill has been set up at the shaft of the El Paso mine and a hole will be drilled from the bottom of the shaft to the tunnel level. Jerry Jones and associates who have leases on the 700 and 300 ft. levels of the Stratton's Independence have cut two shoots of ore and are now shipping high grade material.——Lessees on the American Eagle's property shipped 25 tons of ore that assayed seven ounces gold per ton.— The first clean up of the new Portland mill resulted in a $9000 gold bar. The directors of the company paid a dividend of two cent per share July 15 which amounted to $60,000.

IDAHO

IDAHO COUNTY

Machinery for a 20-stamp mill to be erected at the Comstock mine near Dixie is being hauled to the property and a site for the foundation is being graded. The stamps weigh 1500 lb. and when the mill is completed it will be one of the best equipped in the State.——The adit at the group of William Simpson has reached the hanging wall of the vein exposing 25 ft. of copper ore.—— The 10-stamp mill at the Idaho Champion mine on Crooked river has been started and it is reported that the company is now amply financed to carry on the development of the property.

NEZ PERCE COUNTY

The Idaho company began work May 15 with its new dredge at Pierce, and it is operating successfully and handling 2000 cu. yd. per day of material that runs 20c. per yard. This company has 150 acres of dredgable ground which is estimated to be 8 years' work. The dredge has $3\frac{3}{4}$-cu. ft. buckets, close connected, and was built by the New York Engineering Co. M. H. Hare of Spokane has taken a 20-year lease on the Idaho company's 120 acres of placer ground at the junction of Oro Fino and Rhodes creeks, close to Pierce, the lease including that company's Risdon dredge, which has $3\frac{1}{4}$-cu. ft. buckets, open connected. This ground has an average depth of 12½ ft. and will run 11 to 18c. per yard. The dredge is in operation.

MONTANA

BROADWATER COUNTY

Hampton & Easterly have opened a shoot of high-grade ore in their shaft at a depth of 35 ft. The group is in the Radersburg district, and the claims cover a contact between granite and limestone.——The Little Giant property, west of Radersburg, is being systematically developed from an adit that is being driven to tap the vein at a vertical depth of 400 feet.

DEERLODGE COUNTY

The sale of the Southern Cross mine which has been pending for some time, has fallen through as the principals have been unable to agree on the value of the mine.

NEVADA

ESMERALDA COUNTY

(Special Correspondence).—The proposition to merge the Rawhide Coalition and Queen properties is being well received by stockholders, and it is possible that such a consolidation will be shortly arranged. The officials of the two companies plan the erection of a company mill as soon as the consolidation has been perfected.——The St. Ives' lease on Queen is developing the sulphide ore recently opened on the 400-ft. level. A cross-cut is being run from the 200-ft. level to open the property toward the Grutt-Balloon Hill lease.——The Victor lease is arranging for the deepening of the shaft to the 400-ft. point and the driving of laterals on this level. The last mill-run yielded 476 oz. of bullion, valued at $2700.——The Mint lease on Coalition has arranged for the treatment of about 600 tons of ore at the Klinker mill. A recent test disclosed an approximate recovery value of $12 per ton.—— The Grutt-Balloon Hill lease is steadily shipping ore to the Hazen sampler, two large ore-wagons being engaged in the work.

Rawhide, July 16.

HUMBOLDT COUNTY

(Special Correspondence).—The camp of National is recording increasing activity and the shipment of bullion from the National Mining properties is growing steadily. In June the camp produced $250,000 in bullion and low grade ore to the approximate value of $150,000. The first bullion shipment for July amounted to $51,000. The ore is treated in two old pan amalgamating mills, one operated by the National Mining Co. of Nevada, the other by the Stull brothers.——The Florence Leasing Co. has secured an agreement with the Seven Troughs Mining Co. whereby it will be permitted to run a drift from the bottom of the main 750 ft. shaft to connect with the lease workings. The Seven Troughs Mining Co. is to sink its shaft to the 1000 ft. level.——The Tyler lease on Seven Troughs Coalition has intersected the Winona vein in the shaft at a vertical depth of 422 feet.

Winnemucca, July 15.

WHITE PINE COUNTY

(Special Correspondence).—An air compressor drilling plant has been ordered for the Clipper shaft of the Ely Central company. The company has also ordered two traction No. 23 Star drills, which will be used in exploiting new territory. The Eureka shaft is now down 560 ft., the drift along the fault plane 40 ft., and the south cross-cut 70 ft. The cross-cut is striking stringers of rich sulphide ore, containing from 10 to 30% copper. Twenty-five men are engaged in the erection of the 10-stamp mill of the Nevada Amalgamated at Willow Patch, in the eastern portion of this county. It is expected that the plant will be completed and the stamps dropping in about 60 days.—— Robert Plate arrived last night from an overland trip from Goldfield to Ely. The trip was made for the purpose of securing data as to the probable tonnage of ore along the line of the proposed road. Mr. Plate spent about six weeks on the trip and thoroughly investigated all of the camps along the line of the road. He was particularly impressed with the tremendous showing of ore at Tybo, where development has been carried on for the past four years with a considerable force of men. It is understood that the tonnage of the 2G mine alone would justify the building of the line, it having been estimated that the property could load a train of cars every day for two years from ores already in sight and on the dumps.——Material for the completion of the fifth furnace at the Steptoe smelter is now on the ground, the waste-heat boilers used in connection with the furnace have been bricked in and are being connected. It is expected that the furnace will be completed during the present year. It is greatly needed. The full eight sections of the concentrator are in operation, and about 9000 tons of ore per day are being treated. The hydro-electric pumping plant in Steptoe valley near the old McGill ranch is being used when necessary as an auxiliary source of water-supply for the mill. It has a capacity of 10 second-feet, but the supply varies as it is only used when occasion demands. The new tailing sampler is completed and in operation. It was erected for the purpose of sampling the general run of all tailing. All sampling is done automatically by a system of hydraulic and electric devices.

Ely, July 16.

WASHINGTON

FERRY COUNTY

(Special Correspondence).—The Hess Cyanide System Co., of Spokane, has the contract to erect for the Pacific Ore Co. at Republic, an ore-crushing and cyanide plant of 120 tons per day capacity, which is to be operated on custom ore of that district. The crushing will be done with a jaw crusher and a Chilean mill, supplied by the Hallidie company. The pulp will then be cyanided in Hess agitation and aeration tanks. It is stated that 150 tests have been made on Republic ores by the Hess method, and that the results showed an extraction of 98½% of the assay value of the gold in the ore. The Chilean mill is to pulverize the ore in cyanide solution.——The Kettle River Mining Co., which has a partly developed lead-silver property four miles

from Orient, has ordered a concentrating mill of 50 tons capacity. The plant is equipped with a crusher, rolls, jigs, tables, and vanners. E. W. Scothorn, manager, states that the mine is opened by a 200-ft. vertical shaft, over which is a steam-hoist.——The Republic Mines Corporation has paid a total of $25,000 in dividends to date, and it is announced that the directors will now declare a regular monthly dividend.

Republic, July 16.

KING COUNTY

(Special Correspondence).—The Seattle Cascade Mining Co., which has developed a copper mine four miles from Berlin, has arranged to build a concentrating plant of 100 tons per day capacity, and it intends to have the mill complete by October 1. The ore dressing will be done by a crusher and Chilean mill, and the concentration by Wilfley tables. F. G. Winquist of Seattle, is one of those interested, and Robert Dixon is superintendent.

Berlin, July 18.

KITSAP COUNTY

(Special Correspondence).—The Tripple Trip Mining & Milling Co. is developing by means of shafts, adits, and open-cuts, its group of claims in the Olympic range, 80 miles from Seattle, near the head of Hood's canal. The property is 8 miles from tidewater and 3½ miles from a railroad. It is stated that the mineral zone, in slate and greenstone, contains six veins of manganese ore, tests of samples assaying 55.17% manganese, 0.17% sulphur, 0.11% phosphorus, and 18.62% silica. G. W. Morley and associates are in control.

Seattle, July 18.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—An amalgamation involving 11 claims in the Sheep Creek district was put through last week, the La Rose and Gold Belt groups being placed under one management. The claims were owned before the amalgamation by Edward Peters, of Ymir, W. Kennedy, of Salmo, and associates.——The second payment under the bond on the Echo-Sunrise group in the Bayonne district, has been made by the Mercantile Trust Co., Vancouver. At present R. Dalby Morkill is in charge of development work at the property.——A company known as the West Kootenay Mining Corporation, Ltd., has taken hold of the Joker gold milling property and is installing a new plant and 10-stamp mill.——A cross-cut is being driven on the downward continuation of the recent rich finds in the Rambler-Cariboo from the tenth level.——The True Fissure Mining & Milling Co., N. W. Emmens, engineer, Trout Lake city, has decided to put a tramway in from the mine to the city. The surveys have been completed by Mr. Emmens. Ten carloads of ore averaged $60 per ton. The principal ore-shoot contains galena and gray copper and averages 6 ft. in width. Cincinnati capitalists are behind the company. ——Plans are about completed for the erection of a stamp-mill at the mine of the Aurora Mining & Milling Co., Moyie. H. Dimock is the superintendent.——A deposit of asbestos, about 56 inches in width, has been located near Okanogan falls.——The Red Cliff Mining Co. is planning to build a smelter to complete its mining equipment. The company is having surveys made and will very likely develop 450 horse-power in Lydden creek.

Rossland, July 16.

MEXICO

CHIHUAHUA

The output of the Rio Plata mine, in the Arteaga district, last month was 55,779 oz. of silver; 946 tons of ore were treated, and 68 bars, containing 70,000 oz. of silver, have been shipped to the city of Chihuahua since July 1.

JALISCO

The power lines of the Chapala Hydro-Electric-Irrigation Co. is now fast nearing the El Favor mine, and the sub-station for distribution of power to the entire Hostotipaquillo district is under construction on the company's ground.

SONORA

The Washington copper mine in the Arizpe district which has been under bond to James Douglas and L. D. Ricketts, has reverted to the original owners, F. O. Bostwick and A. R. Dickson. The bond was effective for eight months and during that time $76,000 was spent by the operators, $35,000 of which went as payments to Bostwick and Dickson.——A new cyanide plant is being installed at the El Tigre mine. ——The West Coast Copper Smelting & Refining Co., operating in the southern portion of the State, has purchased machinery for the erection of a smelter, and expects to have the plant completed within a year.——The Sonora Central Mines Co., operating the Santo Domingo property in the vicinity of Alamos, is erecting a concentrating mill that will have a capacity of 100 tons per day.——The Sonora Copper Co. has graded the site for the 100-ton smelter to be erected at the property a mile and a half east of Noria and the machinery has been shipped to the mine.

El Favor Mill, Hostotipaquillo District.

PHILIPPINE ISLANDS

The Headquarters Mining Co. has completed an automobile-road from the property to the Antimok road, a distance of one and a half miles, and is preparing for the installation of a 10-stamp mill. The plant will include a cyanide annex equipped with Ridgway filters.——Several groups of placer claims in the Nueva Ecija district have been tested and proved satisfactory. Negotiations are under way for the installation of dredges and it is believed that at an early date several large contracts will be concluded that will be of great importance to the general development of that district.——The San Mauricio has added several classifiers to its plant.——The Philippine Exploration Co. has secured an option on the property of the Syndicate Mining Co. in Masbate. The option provides for extensive development of the ground.——The dredge of the Philippine Gold Dredging Co. has been moved to the Malaguit river.——The dredge of the Stanley Dredging Co. has cut through the ridge in which it has been working and is now in the rich bottom ground.——A 30-ft. vein of ore assaying $6 to $7 with a streak on one of the walls that assays $40 per ton, has been opened on the Antamok Valley Mining Co.'s property.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

F. W. Bradley is in Alaska.

J. R. Finlay is in San Francisco.

Ralph Arnold was in San Francisco.

J. R. Farrell is at Auburn, California.

Capt. Murdoch Willy is in a hospital at Seattle.

Francis Drake is in the hospital at San Francisco with typhoid, but is doing nicely.

Reiji Kanda was in San Francisco this week on his way from London to Tokyo.

J. D. Hubbard has been visiting mines in Trinity county, California.

T. Lane Carter, of Chicago, is in the West, and is expected in California.

H. W. Hardinge, of New York, has left for Sweden on professional business.

R. B. Lamb is at El Dorado, California, having just come from Radersburg, Montana.

Allen M. Yonge has joined J. R. Farrell and R. C. Shaw in general engineering practice.

Leonard D. Sivyer, of Los Angeles, has been examining mines in New Mexico, Arizona, and Nevada.

Homer Wilson, manager of the Keane-Wonder mine in Death Valley, California, is in San Francisco.

William C. Russell, manager of the Rawley mine at Bonanza, Colorado, is in New York on business.

Algernon Del Mar went north this week as manager for the Fort Bidwell Con. M. Co. at Fort Bidwell, California.

F. A. Horswill, superintendent of the Stone Cañon coal mines, Monterey county, California, is in San Francisco.

J. V. N. Dorr and family are spending the summer in the East. Mr. Dorr's temporary address is 85 Front street, New York City.

F. C. Brown has resigned as general manager for the Waihi Grand Junction and Komata Reef mines of New Zealand and is at Boise, Idaho.

B. R. Bates has left San Jose de Gracia, Sinaloa, Mexico, to take charge of the development work for the Gold & Silver Recovery Co. at Guadalupe.

Erle V. Daveler, recently with the Utah Copper Co. at Garfield, is superintendent for the Phoenix Gold Quartz Mining Co., at Sierra City, California.

OBITUARY

Charles A. White, who died at Washington, D. C., June 29, in his eighty-fifth year, was one of the pioneer geologists of America. He was born at North Dighton, Mass., and educated as a physician, as were many of the early American scientists, the medical schools being the only places at which professional scientific training could then be obtained. While practising at Burlington, Iowa, the young physician began collecting and studying the fossils that are there so abundant. In 1866 he succeeded in getting the Iowa Geological Survey re-established, and while in charge of it from 1866 to 1870, did much to promote the development of that State. In later years he served as professor of Natural History at Iowa State University and at Bowdoin College, and as geologist and paleontologist in connection with the 'Powell', 'Hayden', and United States Geological Surveys. From 1879 on he was connected with the United States Museum. While his major scientific contributions relate to the paleontology and stratigraphy of the Cretaceous, it should not be forgotten that his earlier work on coal was of direct and significant economic import. Dr. White was a charming man who contributed to his profession not only by his personal work, but also by inspiring and helping the younger men who were his associates and successors.

Market Reports

LOCAL METAL PRICES

San Francisco, July 21

Antimony	12 – 13½c	Quicksilver (flask)	67 – 67½
Electrolytic Copper	14½ – 15c	Spelter	5½c
Pig Lead	4.50 – 4.60	Tin	32½ – 33c

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead	Spelter	Silver per oz
July 14	12.00	4.41	4.90	64½
" 15	12.13	4.41	4.90	64½
" 16	12.13	4.41	4.90	64½
" 17	Sunday.	No market		
" 18	12.13	4.43	4.90	64½
" 19	12.13	4.43	4.90	64½
" 20	12.13	4.43	4.90	64½

ANGLO-AMERICAN SHARES

Cabled from London

	July 14. £ s. d.	July 21. £ s. d.
Camp Bird	1 7 8	1 7 3
El Oro	1 6 6	1 6 6
Esperanza	2 12 0 ex div.	2 12 6
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 0	0 6 0
Mexico Mines	9 2 6	8 18 9
Tomboy	0 16 6	0 16 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, July 21.		Closing prices, July 21.
Adventure	4⅛	Mohawk	42½
Allouez	34	North Butte	22⅝
Atlantic	6	Old Dominion	33
Calumet & Arizona	69	Osceola	119
Calumet & Hecla	510	Parrot	12⅝
Centennial	15	Santa Fe	1⅛
Copper Range	69½	Shannon	9⅝
Daly West	5½	Superior & Pittsburg	10⅜
Franklin	9¾	Tamarack	51
Granby	31	Trinity	4⅝
Greene-Cananea, ctf	6⅞	Utah Con	20½
Isle Royale	15	Victoria	2½
La Salle	9¼	Winona	6
Mass Copper	6¼	Wolverine	105

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, July 21.		Closing prices, July 21.
Amalgamated Copper	60⅝	Miami Copper	18⅞
A. S. & R. Co.	70½	Mines Co. of America	⅝
Boston Copper	18⅛	Montgomery-Shoshone	⅝
B. C. Copper Co.	5	Nevada Con	18⅞
Butte Coalition	17½	Nevada Utah	½
Chino	12	Nipissing	10⅞
Davis Daly	1½	Ohio Copper	1⅝
Dolores	6	Ray Central	2⅞
El Rayo	3⅞	Ray Con	17⅛
Ely Central	⅞	South Utah	1¼
First National	3⅛	Superior & Pittsburg	10¼
Giroux	6¼	Tenn. Copper	22¾
Guanajuato Con	1	Trinity	5¾
Inspiration	7⅛	Tuolumne Copper	2⅝
Kerr Lake	7⅞	United Copper	4¾
La Rose	4	Utah Copper	44
Mason Valley	6⅞	Yukon Gold	4

SOUTHERN NEVADA STOCKS.

San Francisco, July 21.

Atlanta	$ 12	Mayflower	$ 3
Belmont	4.00	Midway	25
Booth	13	Montana Tonopah	97
Columbia Mtn	5	Nevada Hills	2.15
Combination Fraction	49	Pittsburg Silver Peak	60
Daisy	5	Rawhide Coalition	15
Fairview Eagle	40	Rawhide Queen	25
Florence	2.50	Round Mountain	46
Goldfield Con	8.55	Sandstorm	4
Gold Kewenas	5	Silver Pick	7
Great Bend	3	St. Ives	13
Jim Butler	21	Tonopah Extension	75
Jumbo Extension	25	Tonopah of Nevada	8.70
MacNamara	32	West End	55

(By courtesy of San Francisco Stock Exchange.)

Recent Publications

RE-SURVEY OF THE MARYLAND-PENNSYLVANIA BOUNDARY. PART OF THE MASON AND DIXON LINE. Maryland Geol. Surv., Vol. VII. Pp. 412, ill., map, index. Baltimore, 1908.

COAL FIELDS OF NORTHWESTERN COLORADO AND NORTHEASTERN UTAH. By Hoyt S. Gale. U. S. Geol. Surv., Bull. 415. Pp. 265, ill. maps, index. Washington, 1910. This is an excellent account of important coalfields and a good example of high-class geological work.

OCCURRENCE OF ARSENIC IN SOILS, PLANTS, FRUITS, AND ANIMALS. By Wm. P. Headden. Re-print, Proc. Colorado Sci. Soc., Vol. IX. Pp. 345-360. Denver, 1910. That arsenic is widespread in soils is not generally appreciated, and in connection with smelter fume investigations this compilation is important.

ENGINEER MOUNTAIN FOLIO.. By Whitman Cross and Allen D. Hole. U. S. Geol. Surv. Geol. Atlas U. S., No. 171. Washington, 1910. Price 25c. This is another of the excellent folios descriptive of portions of the San Juan region of Colorado, prepared by Mr. Cross and his associates. The Engineer Mountain quadrangle lies east of Rico, south of Telluride, and west of Needles mountains.

SURFACE WATER SUPPLY OF THE UNITED STATES, 1907-8. Water Supply Papers, U. S. Geol. Surv. The following additional reports are now available: Pt. VII, Lower Mississippi Basin, by W. B. Freeman, W. A. Lamb, and R. H. Bolster, No. 247, pp. 124; Pt. VIII, Western Gulf of Mexico, by W. B. Freeman, W. A. Lamb, and R. H. Bolster, No. 248, pp. 171; Pt. IX, Colorado River Basin, by W. B. Freeman and R. H. Bolster, No. 249, pp. 206; Pt. X, The Great Basin, by E. C. La Rue and F. F. Henshaw, No. 250, pp. 151. All were prepared under the direction of M. O. Leighton and any may be obtained by application to the Director of the U. S. Geological Survey, Washington, D. C.

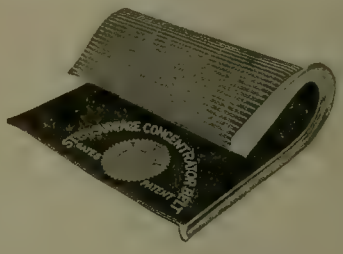
THE CHERRY MINE DISASTER. By George S. Rice. Pamphlet. Pp. 47. This is a full and careful account of the great disaster written by a mining engineer present during the rescue work and long familiar with mining in northern Illinois. Indeed, Mr. Rice, before he became connected with the mine accident investigations of the U. S. Geological Survey, was mining engineer for the company that was succeeded by the St. Paul Coal Co. His personal familiarity with the conditions and men concerned, coupled with his wide knowledge of mine-rescue work, makes this the most authoritative account of an accident which is certain to have a large influence on American mining methods.

THEORIES OF THE NATURE OF THE EARTH'S INTERIOR. By E. H. L. Schwarz. Re-print *So. African Jour. Science*, April 1910. Pp. 234-241. Rejecting the nebular hypothesis as not only disproved but contradicted by modern knowledge, Mr. Schwarz finds on examination of the records of transmission of earthquake shocks, reason for belief in a solid interior. The results of deep drilling are shown to be contradictory and variable as regards increase of heat with depth, and the conclusion is reached that the earth consists of a self-heating crust resting upon a solid and probably cold nucleus. The sources of the apparent heat of the earth are held to be chemical reactions and radio activity. The influence of these ideas on the possibility of deeper mining is suggested.

MARYLAND CONSERVATION COMMISSION REPORT, 1908, 1909. Pp. 204, ill., index. Baltimore, 1909. The report of this Commission, consisting of B. N. Baker, W. B. Clark, and Edward Hirsch, while preliminary in scope, is the most elaborate yet issued by any of the numerous conservation commissions appointed as a result of the famous conference of the Governors called by Mr. Roosevelt. The Commission has attempted only a general review of the resources of the State and finds much useful investigative work already under way. Gaps are indicated and recommendations are made. The report is an excellent illustration of the useful purpose that may be subserved by a joint board correlating the work of the numerous scientific and technical bureaus that have grown up somewhat haphazardly in most American States.

A NEW CONCENTRATOR BELT

In these days of constant striving for improvement in the art of ore dressing, any detail which makes for greater recovery and larger capacity will be welcomed by millmen. The Goodyear Rubber Co., San Francisco, has just perfected a concentrator belt for which wonderful claims are made. It is like the ordinary belt except that the surface



is formed in transverse steps ¼-in. wide and 1/32-in. deep, with the inclination toward the recovery point. The makers claim that it is practically impossible to overload the belt and therefore its capacity is much larger than that of any riffled or smooth surface belt, and also that cleaner concentrate and lower tailing result from a machine equipped with this belt. Detailed information will be sent by the Goodyear Rubber Co. to any one interested.

COMMERCIAL PARAGRAPHS

The WAGNER ELECTRIC MFG. CO., St. Louis, has opened an office at Birmingham, Ala. J. F. Jones will be in charge.

The BERKELEY STEEL CO., San Francisco, has moved its general office to the Balboa building. The works are at Richmond, California.

THE PRODUCERS ROCK & GRAVEL CO., of Victoria, B. C., has finished the installation of a plant for crushing blue trap rock to be used in macadamizing the streets of Victoria and Vancouver. J. J. Maney, of Seattle, was engineer.

C. E. BOGARDUS, assayer and chemist, Seattle, now has associated with him C. C. O'Louchlin, formerly chief chemist at the Mammoth smelter at Kennett, Cal., and it is the intention to take up umpire and control work as a special line at the Bogardus laboratories.

In the advertisement of the TROJAN POWER CO., in the July 2 issue of the *Mining and Scientific Press*, there was a halftone illustrating the effect of a blast of Trojan powder at the Cumbler quarry, Steelton, Pa. Seven thousand tons of rock were mentioned as having been displaced by a single blast of four and one-half tons of Trojan powder. This is just one-tenth of the actual accomplishment. In other words, one of the zeros were omitted from the number of tons of rock broken, seventy thousand being the correct figure—with as stated, four and one-half tons of Trojan powder.

CATALOGUES RECEIVED

D. D. DEMAREST CO., San Francisco, Circular No. 30. 'Pacific Rock Drills.' A pamphlet showing clearly the salient points and advantages of this well known rock drill. The design has been modified slightly in minor details, and the drill is now made in seven sizes. One feature of this drill, which commends it to all users of the piston type, is the fact that the lugs on the cylinder and the seats on the shell are not in the same plane. Therefore wear incident to use does not cause troublesome side-play making the starting of new holes so difficult. A novel scheme for taking up wear is provided. Illustrated, 32 pages, 7 by 10 inches.

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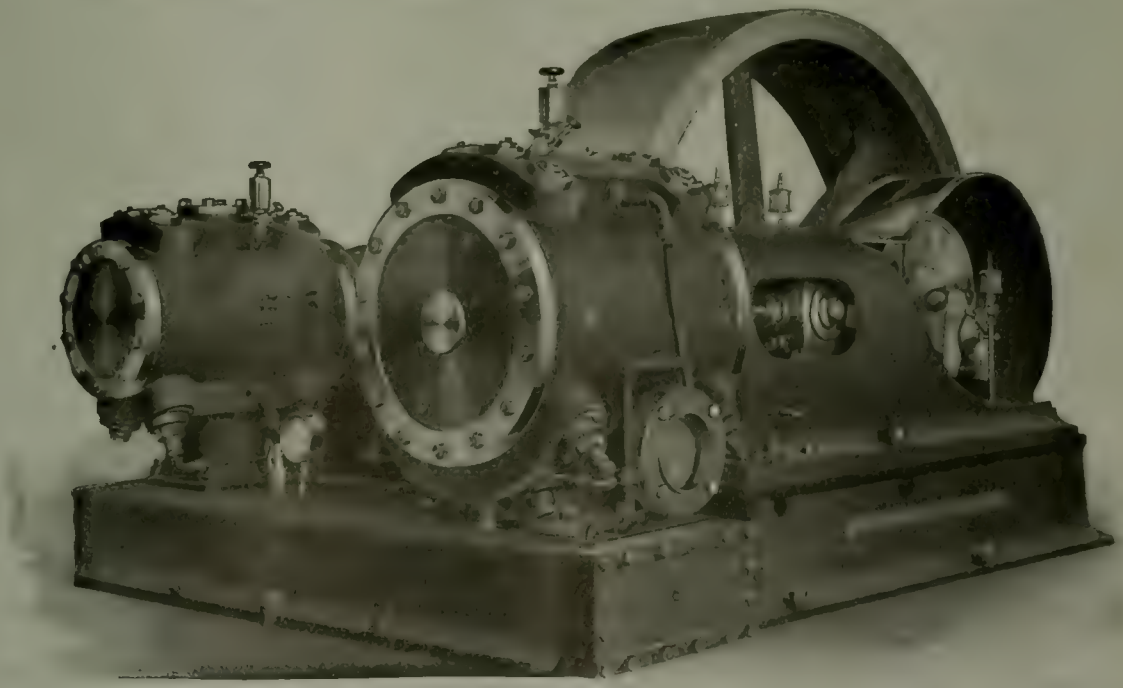

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EDITORIAL

CHANGES in the boundaries of the National Forests are being made constantly as surveys are perfected. On July 1, 9389 acres were added to the Sequoia forest and 65,490 acres eliminated. At the same time, by transfer, the Kern National Forest was established with headquarters at Bakersfield.

A WORLD TRADE directory is being compiled by the Bureau of Manufacturers at Washington. Several hundred thousand names of firms in foreign countries engaged in international trade have been compiled and from these a classified list of 125,000 has been selected and will be published with addresses.

PRELIMINARY figures indicate that dividends paid during July by oil companies listed on the San Francisco Stock Exchange will amount to somewhat more than $1,500,000. This is an increase of more than $100,000 over the amount paid in June and will bring the grand total so far paid to well over $34,000,000.

METALLURGY on the Rand is discussed by Mr. Horace G. Nichols in the July number of *The Mining Magazine*. Other titles include, 'Valuation of Copper in Chile,' by L. C. Stuckey; 'Mobility in Placer Mining,' by J. Power Hutchins; 'Milling of Lead Silver Ore,' by Gelasio Caetani; and 'The Oilfields of Mexico,' by H. A. Denny. As usual the editorial and special correspondence cover a wide and interesting field.

COPPER is reported to be already arriving from Africa by the shipload and the great inundating waves of red metal are said to be making a new high-level shore-line about Perth Amboy, New Jersey. Since, however, the press dispatch that contains the information credits the ownership of Tanganyika Concessions Limited to the "Guggenheim-Ryan-British Syndicate" and is otherwise full of inaccuracies, we think the American Smelting & Refining Company will be able to work up the actual present imports before the smelter becomes buried. Africa will certainly become an important factor in copper later, but just now the accent may be properly placed on the last word.

MISBRANDING has been all too common in many directions. The National Pure Food and Drug Law, while possibly a questionable extension of the power of the Federal government over interstate commerce, has undoubtedly done much good. Extension of the principle to other products such as rope, cloth, and powder, is likely soon to be urged.

There is no satisfaction to the miner in having his health protected as against impure food and drink, only to be blown up by powder stronger or weaker than he has reason to suspect from the label. Reputable manufacturers are assisted rather than harmed by such laws when properly drawn, and the others deserve no protection.

FAILURE of Mr. J. M. Guffey calls attention to the fact that he and his associates, while fortunate in their investments in oil and coal properties in Pennsylvania and West Virginia, have not done well in Western metal mining. At Thunder Mountain, at Idaho Springs, and at various other points they have dropped much good money without adequate return. To succeed in metal mining requires more than ability to make prompt decisions and the readiness to accept long chances that characterize the successful oil operator. Mr. Guffey has acquired considerable experience at a rather large expense. He still owns many valuable properties and we wish him better success in the future.

FORMAL opening of the new Portland mill at Cripple Creek was celebrated July 19 in the good old American fashion by speeches and a luncheon attended by a number of the Colorado mining engineers and metallurgists. The new plant is designed to treat, without roasting, ore assaying $2.40 per ton, and 8000 tons are said to have been handled at a profit of 75 cents per ton in the three weeks preceding formal opening. The process is one of concentration and simple cyanidation, except that while agitating the slime, a secret solvent is added. It is a matter of regret that despite the friendly relations obtaining between Colorado metallurgists, the officers of the Portland company, because of threatened patent litigation, have not felt free to announce the details of the method. The building of this mill is another step toward the winning of the greatest metallurgical prize in Colorado, successful treatment of low grade ore from Cripple Creek.

TENNESSEE zinc mines are again attracting attention. As is well known, eastern Tennessee and southwestern Virginia contain considerable areas of dolomite in which blende and calamine are widely disseminated. At various times considerable quantities of ore have been shipped. Of recent years the zinc industry in this region has not flourished and the Bertha furnace at Pulaski, Virginia, has shipped in ore from New Jersey and elsewhere in order to continue to produce the high-grade spelter for which it is famous. Conditions in the zinc industry, fortunately, are improving, and Tennessee with other States is like to benefit. The Grasselli Chemical Company has become interested, followed by the Osgood Exploring Company of Chicago. The Grasselli company in particular is well equipped to solve the metallurgical problems of the district. At Park City, Utah, by an ingenious combination of close sizing and dry concentration, the metallurgists of this company are making a marketable product from an ore exceedingly difficult to handle. In Wisconsin and elsewhere the concern is a large buyer of low-grade ore and at the works at Cleveland, Ohio, and Parkersburg, West Virginia, its technical men have been doing excellent work.

MINING ENGINEERS rarely devote much attention to politics. The country would be better served if they did. Farmers and lawyers form an undue proportion of the membership of legislative bodies, and a few engineers would prevent a good many impractical experiments at the same time that they would naturally be constructive in their tendencies. California is the only State represented in Congress by a man who gives his occupation as 'mining engineer.' Mr. W. F. Englebright, who represents the first California district, has abundantly proved his right to the title by excellent work at Nevada City and elsewhere. At Washington he has been very influential in shaping legislation relative to mining matters. It was due to his insistence that lands containing precious metals were excepted from the operation of the new withdrawal law, and in the creation of the Bureau of Mines and other matters of concern to the mining industry he has been active and effective. We do not always agree with him, but, if it be not permitted a technical paper to express an opinion in such matters, we may at least make clear our hope that the voters of his district, in which there are large mining interests, will continue for many years to send him to Washington. We like to think that there is at least one mining engineer in Congress.

COLORADO mining conditions have not been altogether satisfactory in the last year or two. There is undoubtedly a shortage of certain sorts of ore formerly mined in abundance, and the inflow of capital has been checked, to some extent at least. Real conditions are not as bad as they appear at first glance. Improvements in hydrometallurgy have diverted to mills, ore that formerly went to the smelters; and erection of furnaces in Utah and elsewhere has decreased the amount of ore from other States reduced in Colorado. If it be true that the amount of outside money now seeking investment in Colorado mines is less than in former years, it should be remembered that irrigation and other enterprises make new drafts on the supply. It is fair also to recall the fact that much of the money formerly sent to Colorado was in no sense invested. It was spent in stock exchange gambling. The benefit from such expenditure is dubious, to say the least. Colorado is growing up and is resolutely putting these excesses of youth behind. On another page we publish an address prepared by a committee appointed at a recent meeting of the mining men of the State. It is well worth reading, and we shall watch with interest the career of the new chapter of the American Mining Congress that has been organized. The representative character of the men concerned in the movement may be inferred from the list of directors chosen. They are, Messrs. E. A. Colburn, W. J. Cox, E. M. Delavergne, A. W. Warwick, Bulkeley Wells, A. L. Burris, R. L. Martin, John R. Wood, D. W.

Brunton, John Daizell, A. C. Brownlee, J. F. Callbreath, Max Boehmer, Philip Argall, J. W. Dean and A. V. Bohn.

TEXAS iron ores are now attracting attention. It is known that the big steel companies have had men examining the field, and shipments to the East have been made. Iron ore occurs widely distributed in the central and northeastern parts of the State. Mr. E. C. Eckel, who examined the deposits in 1904, placed the total area of the iron ore districts at 1000 square miles. The ore compares favorably as to quality with the brown ores of the Appalachian region. The individual beds, however, are thin and a wide area would need to be drawn on in supplying any one furnace. Fortunately the region is agricultural so that railways need not rely on ore alone for freight. The nearness of the field to high-grade coal in Arkansas and Oklahoma, makes it probable that smelting can be done to advantage and establishment of a new centre of pig iron production is entirely probable.

Mining Matters at Washington

Bureau of Mines matters continue to attract attention. The plans for this year announced by the acting director, Mr. George Otis Smith, are excellent, though a larger allotment of funds to investigation of problems relating to metal mining will naturally be expected next year. For a preliminary survey of the field, however, the provision is adequate. The new work is being systematically built on the old, and full advantage is being taken of the excellent progress made by the Technologic Branch of the Geological Survey under Mr. J. A. Holmes before the establishment of the Bureau. Indeed, while Mr. Smith is quite unwilling to endorse Mr. Holmes for the position of Director, he apparently has no such hesitation in adopting his plans. Criticism of the position taken by Mr. Smith and his associates in the matter is widespread. At the meeting of Colorado mining men, reported on another page, strong resolutions in regard to the matter were passed. At the Grass Valley meeting of the Mining and Metallurgical Society of America, the feeling voiced was the same. That the men concerned are not merely 'a few talkers and promoters' who 'take themselves too seriously' may be seen by looking over the list. It is interesting to note that whereas Mr. Smith has condemned Mr. Holmes for being too active a 'lobbyist,' he has found it necessary to enter upon a press campaign of explanation of his own activity in behalf of a rival candidate. The truth is that the only centre of opposition to the appointment of Mr. Holmes, the logical man for the place, is the Geological Survey, and that there has been in the latter organization a good deal of jealousy, and not a little of what others regard as prejudice against Mr. Holmes and his work. So far, no good reason against his appointment has been made public, and until better reasons than any yet advanced be given we shall continue to urge the appointment as Director of the Bureau of Mines of the man most intimately associated with its creation, Mr. Holmes.

We are not among those who fear harm to the Geological Survey because of the establishment of the Bureau of Mines except as harping on the matter may produce that result. As a matter of fact the Survey has been weakened rather than the reverse every time it has taken up work aside from its main and legitimate duties. It has frequently had to assume related functions for which no other provision has been made. As a temporary matter we believe this proper, but if the new work does not shortly win the support that it needs, if it can not stand on its own merits, it is a source of trouble and danger to the Survey and had much better be dropped until conditions change for the better. Ethnology, Forestry, Reclamation, and now Technology, have been successively developed and then cut off from the Survey, but despite these 'losses' the Survey is now stronger, and better established in the good will of the public and of Congress than at any time in the past. It will continue to occupy this fortunate position so long as it does its own work excellently and confines its activities in other directions to sympathetic assistance. Any other attitude on the part of the Survey or its friends creates suspicion. It is a case of protesting too much.

Stock-Selling Geology

Cobalt has had to struggle against many difficulties, not the least of which has been the 'favorable' reports circulated by many stock-selling companies. In one such report a 'professor' who states frankly, "My views may differ widely with the views of other geologists" (which they do), lays much stress on 'Lines of Weakness.' In defining them he says:

"To explain what a Line of Weakness means, I may compare the same with a regional metamorphism —denoting that the rocks for a long distance in certain directions have been altered by some agencies— however, in our case here the lines of Weakness do not metamorphose the rocks regionally, but locally, in other words, the Line of Weakness represents a big contact zone fissured all through and probably including big fissures or even an abyss running through a considerable length of the region, dividing either two or more different rock formations and denoting the different physical aspects of the rocks of the same origin, but separated through different causes—like through differential movements of the earth, or the shrinkage of the crust, etc."

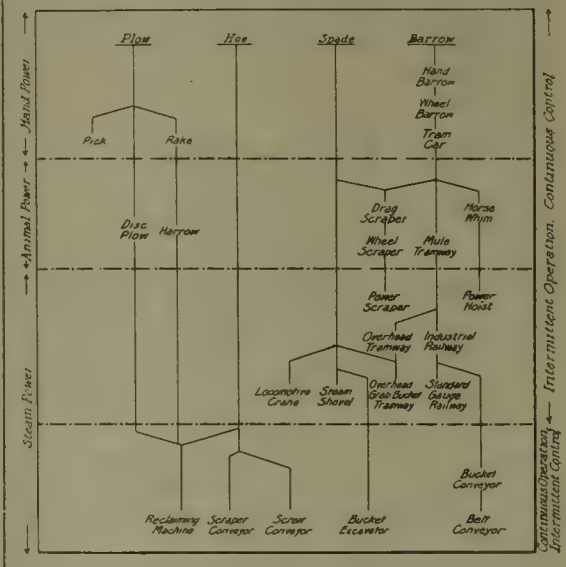
We quite agree that there is a line of weakness here but perhaps we would not define it quite as does the professor whom, we are told, is "a mining geologist of world-wide experience." This lends peculiar interest to his announcement that "I have found at last the very essential cores of the Diabase, which originated the silver deposition in this district, then the Diabase must be underlaid with Huronian or Keewatin rocks at a minimum depth of 500 to 600 feet below Giroux Lake level." There has been much such stuff written about Cobalt and apparently more will be sent out describing Porcupine. The fact that the new Canadian districts make steady progress nevertheless is an excellent assurance of their real value.

Material-Handling Machinery and Its Evolution

By E. H. Messiter

At a very early period man, or his predecessor, must have found it necessary to dig and move earth. This must have occurred long before there was anything with which to do it except the hands. At a certain stage one can imagine some crude implement brought into use to help in the operations of scratching, scraping, digging, and holding and carrying the earthy material. This implement was the progenitor of the whole family of devices we use today for handling material. Remembering that these devices are merely extensions of the human hand and have been made by it only to perform the wishes of the owner of the hand, it is natural to assume that they have been evolved according to the same laws that have controlled the development of the hand itself. Viewed in this way, these implements belong to the animal kingdom and their characteristics are a part of the characteristics of the men that made them. So we can classify them into genuses and species, and study their variations and survivals in much the same way as if they were animals. We ought to be able to construct the family trees of our material-handling devices, and may possibly find the resulting classification instructive.

Starting with the first implement, which may have been a thin flat piece of stone performing the four functions of breaking, scraping, digging, and holding or carrying earth, we may assume that it was early differentiated into the ancestors of the plow, the hoe, the spade, and the barrow. The two fundamental operations are breaking and moving. The plow devotes itself almost entirely to the former, while as we pass successively to the hoe, the spade, and the barrow, the element of moving becomes more and more prominent. The plow, like its near relatives, the pick, rake, and harrow, has undergone changes in material and form, adapting it more perfectly to its work, but these changes have not given new names to the later forms. The disc plow is the most radical development. Only recently has the plow entered into the design of material-handling machinery, and, with the exception of a cyanide tank excavating device, only in combination with one or more of the other elementary implements. The hoe has had a history similar to that of the plow, but unlike the plow it may be regarded as the direct forerunner of some of our common material-handling machines, for instance, the scraper and screw conveyors, both of which are equivalent to continuously acting hoes. The spade or shovel has simply grown by combination with various elementary machines and prime movers into the steam or electric shovel and the grab-bucket and scraper-excavator. The continuous-bucket excavator is essentially a series of shovels and, therefore, a direct descendant in this line. The barrow family is perhaps the most interesting of all. The first barrow was probably a slab of stone or other material on which more earth could be carried than in the hands. The barrow proper, at an early period came to have four handles, so that it could be carried between two men. It was then a hand-barrow. Later a wheel took the place of two of the handles and the wheelbarrow had come into existence. With increase in capacity and efficiency the wheelbarrow came to have two wheels. While the wheelbarrow was always guided by hand, something in the nature of a track was doubtless used at an early period. At a certain stage of the development the number of wheels was increased to four and the tracks took a form that permitted them to guide the wheels. Then the barrow became a car. Animal power and then steam power were called in and the cars were coupled into trains, initiating the industrial railway. The barrow body began to develop special features to assist in loading and unloading, and with further increase in size and another increase in the



Evolution of Machinery for Handling Materials.

number of wheels, the standard-gauge gondola and hopper cars came into existence. After the arrival at the four-wheeled stage an independent branch of the barrow family was started. Instead of making direct application of animal or steam power, cars began to be hitched to chains and ropes. When these were endless the cable railway, or its equivalent, made its appearance. At this point is noted also the inclined and vertical hoists in which the rope is attached either to the car or bucket, or to a carriage or cage on which they rest. The cars at first were not permanently attached to the rope or chain, but later this was done and the cars placed close to each other, end to end, or even over-lapping. This was probably the first conveyor. Like many other members of this branch of the barrow family, the bucket-conveyor is not limited to transportation in directions nearly horizontal. Some of them, with slight modification, carry material vertically. In some forms of the continuous-bucket conveyor the 'cars' returned to the original flat shape of the barrow, and the conveyor became a continuous apron. Then an adaptation to environment as bold as some that are found among animals and plants took place. The axles of the wheels were made stationary and the

apron rode on the wheels. A belt performed the duties of the chain as well as of the apron and the belt-conveyor was born.

Now, look at some of the appliances of mixed ancestry. The drag-scraper and wheeled scraper are combinations of shovel and barrow. The grab-bucket and trolley, running on a wire rope or a bridge are combinations of a higher order. In each of these devices the barrow has one or more cutting edges which make it also a shovel. A combination of the plow, the barrow and the hoe has recently been made for gathering and mixing ores and fluxes from mechanically made ore-beds. This has been called a reclaiming machine. The accompanying diagram shows these supposed family relations of the material handling devices at a glance. In the margin are shown the transitions from man power to animal power and to steam (or electrical) power. More significant is the line marking the transition from intermittent to continuous operation. All of the devices above this line require that the hand that controls them shall not relax its grasp while they are in use. The hand may hold the implement itself or hold a bridle or a lever, but if the hand leaves the mechanism entirely it ceases its work. In the case of the continuously-operating devices, on the contrary, the hand that controls them may leave them for an indefinite period. If we exclude the method using water, air, or explosives in the handling of material, it would appear that we can find a place on this diagram for any of the machines in common use for handling earth or other loose or broken material.

The period of the lifetime of the *Mining and Scientific Press* has witnessed many of the applications of mechanical power to the older appliances and the greater part of the development of the continuous devices. During the latter part of this period the newer devices have been extensively introduced into mining and metallurgical plants. In general, the greater the tonnage being handled the greater the need of mechanical handling. We would thus expect to find the best examples at the larger mines and at concentrating and smelting works where the tonnage from the smaller mines is combined. The installation of steam shovels and hoisting and conveying machinery at the more important mines is well known. Here may be noted the marked tendency observable in recent years toward the introduction of crushing machinery nearer and nearer to the point where the transportation of the ore commences. Crushing makes the mechanical handling easier and mechanical handling makes crushing easier. The concentrating processes begin with crushing, and there is an increasing tendency among smelting authorities to eliminate large lumps from the charge, and thus to commence their operations in the same way. In smelting works the handling of material of the kind here considered is nearly coextensive with the operation of furnace charging. The methods of handling preparatory to the actual introduction of the charge into the furnace are largely determined by the necessity of weighing and mixing the several ingredients. It has been customary to store the different materials separately and then weigh out the proper quantities in barrows or cars. When the number of ingredients is too great to be handled conveniently in this way it has been the practice to bed a part of them by spreading them in successive overlying layers on the ground. This has been done by hand. The cost and inherent imperfections of this method have prevented its use for mixing the entire charge. Within the last decade machinery has been applied to this operation and at two large copper smelting plants all of the charge is bedded and reclaimed by cars and steam shovels, or by belt conveyors and special reclaiming machinery. At several other plants machinery is used in bedding part of the charge but not in reclaiming it.

The tendency to substitute the newer, continuous methods of handling is becoming increasingly evident, and so the use of cars and barrows for the moving of material in course of treatment is decreasing. A new factor which will doubtless accellerate this tendency is the recent development of efficient and reliable apparatus for weighing material while in motion on conveyors.

Flint pebbles are not exported to the United States from any of the three principal seaports of Germany, namely, Hamburg, Bremen, and Stettin. They are not found in the neighborhood of the above places. Such pebbles, however, are gathered, although in quantities barely sufficient to supply local demands, in the quarries of some of the portland cement concerns in Germany, particularly the Hemmoor works near Cuxhaven. These flints are not round and, before they can be used for grinding purposes, have to be treated until they become of the right shape. For this purpose they are used in pans where the clay and lime are washed, and when sufficiently round are transferred to the tube-mills. Flint pebbles are also found in the chalk works on the islands of Rugen and Wollin in the Baltic, and thence are exported in small quantities to Russia. They are also found on the Danish coast. The Hemmoor works are producing the flint pebbles, but not in sufficient quantities to fill local demands, and no portland cement factory in Germany sells the pebbles. The Hemmoor company has bought good pebbles from several firms in Copenhagen, Hamburg, and Stettin. One of the largest German handlers of flint pebbles states that flint pebbles, such as are used in tube-mills, are not found in Germany to any considerable extent. Few, if any, flint pebbles are exported from Germany to the United States. The principal sources of supply are the French coast from Havre to Calais, the southern coast of England, and some portions of the Danish coast. The exact amount of the foreign trade of Germany in flint pebbles cannot be stated, as these products are classed in the official statistics under kieselgur, quartz, quartz sand, and are not separated.

Power required to start tube-mills in motion is relatively great, being approximately 35 hp. for a 13 ft. by 3 ft. 3 in. mill and 70 hp. for a 22 ft. by 5 ft. mill, but when under way the power required is diminished to about 25 hp. for the smaller and 50 hp. for the larger mill.

Colorado Mining Conditions

The following is the report of the committee appointed for the purpose of organizing the mining industry of Colorado at a meeting called by the American Mining Congress, July 13, 1910.

To the mining men of Colorado in meeting assembled: The members of your committee appointed at a general meeting at Denver called by the American Mining Congress, July 13, acknowledges the honor bestowed upon them and report, that after giving careful consideration to all the remarks of the speakers of the meetings and giving due consideration to the volume of correspondence which has been received from all parts of the State, there appears to be an almost universal demand for the formation of a Colorado Chapter of the American Mining Congress. Your committee therefore presents and incorporates as a part of this report a preamble setting forth the objects of the association and a set of by-laws under which it can commence to do business. In presenting these by-laws we wish to say that they have been made as simple as possible in order that after the organization is completed, the mining men of the State may have the opportunity of giving fuller voice as to laws under which the Colorado Chapter of the American Mining Congress should continue to exist and do its work. Your committee believes that in addition to the preamble to the constitution of the proposed Chapter that it is advisable to indicate what, in its judgment, is the main and immediate work to be done by an association of Colorado mining men. Before doing so, however, it is premised that the suggestions herein made do not comprise all the work that must be done, but simply the work which should be immediately taken in hand. Our suggestions are as follows: (1) The Colorado mining men should sustain the officers of the American Mining Congress in their efforts to see that an adequate Bureau of Mines be completely organized and continuously sustained and to see that the mining interests of Colorado receive the proper Federal encouragement and protection that is its due. (2) It is the obvious duty of the Colorado mining men to see that all the State organizations that bear upon mining should fulfil their functions in the best interests of the industry and to sustain as far as possible the efforts of the officers to improve the services that they are rendering the State. We particularly mention the office of the Commissioner of Mines, the School of Mines, the State Geologist, and the Commissioner of Immigration. (3) That certain bills be carefully considered for representation to the State legislature and that other needed bills be prepared and organized efforts be made to secure their passage. (4) In view of the apparently settled national policy of forest reservation and mineral conservation, it is of importance that the Colorado mining men should seriously consider the new conditions under which they are working and to secure, if possible, such governmental regulations as will best serve the interests of the State at large and of the mining industry in particular. (5) That the collection of such commercial statistics as do not come before the purview of the State and Federal officers be one of the principal objects of the association. It is needless to say that in this connection it is necessary to have the widest publicity and therefore the more active co-operation of the State press should be most cordially invited. (6) The relationship of the mining industry to the public service corporations should be a matter of deep concern. It should be the object of the association to endeavor to harmonize the relation between all branches of the industry to the end that all interests be properly served and protected.

In regard to the question of the protection of investors in mining enterprises, it is the belief of your committee that this matter be attacked very conservatively and yet efficiently, but in such a manner that no aspersions be cast upon worthy enterprises. This is a matter that should be approached cautiously yet with perfect candor. The problem is an exceedingly difficult one, and we feel that in attacking the operations of the dishonest promoter every care should be taken so that the interests of those who are honestly and in good faith endeavoring to raise capital for mining enterprises be not jeopardized. In presenting this report, your committee in no way wishes to bind the actions of the proposed organization, but simply to indicate to the miners of Colorado what in their judgment, after careful consideration, appears to be the more pressing needs of the mining industry within the borders of the State. Finally we wish to say that it is the opinion of your committee that the mining industry in Colorado is by no means in a moribund condition. In the San Juan, Leadville, Cripple Creek, and in the northern mineral fields there is a great deal of activity and the mineral production of the State on the whole is at this time fairly satisfactory. However, we recognize that the industry is not making the progress that the resources of the State warrant.

At the meeting the following resolution was unanimously adopted: Whereas, the interests which united in seeking the creation of a Bureau of Mines have almost, if not quite unanimously urged the selection of J. A. Holmes as the Director of this new Bureau, and whereas, the success of the Bureau is being jeopardized by a temporary appointment and the appointment of Mr. Holmes is being prevented by forces which have always opposed the creation of a Bureau upon the ground that it could serve no useful purpose, and whereas, the success of the Bureau for which Western mining interests have been fighting for fourteen years requires that the Bureau shall be put in charge of a man who understands the need of the mining industry and who believes that the Bureau can perform important public service. Now therefore be it resolved that the mining men of Colorado, in convention assembled, do most respectfully and urgently petition the President of the United States that he shall forthwith appoint as Director of the Bureau of Mines, Joseph A. Holmes; and be it further resolved that a copy of these resolutions be forwarded to the President, William H. Taft, and Hon. R. A. Ballinger, Secretary of the Interior.

Gold Mines in Eastern Oregon

STAFF CORRESPONDENCE

The mine of the Columbia Gold Mining Co. has been in successful operation during the last 14 years. Its location is on the great lode that strikes northeast-southwest through the slate formation of the Cracker Creek mining district, in Baker county, Oregon. The mining properties on this lode that are important in the history of the county comprise the Blasley-Elkhorn, North Pole, Eureka & Excelsior, Columbia, Golconda, Amazon, and Bunker Hill, the distance from the Baisley Elkhorn, on the north, to the Bunker Hill on the south end of the lode being seven miles. The Baisley Elkhorn was in operation several years, but is now idle; the North Pole, belonging to Baring Bros. of London, was operated 10 to 12 years under the management of Emil Melzer, and during the greater part of that period it made a record of yielding the highest profits of any mine in Oregon. It was closed within the last two years because of the failure of the owners to allow sufficient funds to be set aside to continue the development necessary in keeping up ore reserves. The general verdict of mining men is that the North Pole is still a good mine. The property is well equipped with an aerial tramway and a mill for concentration and cyanidation. The E. & E. group lies between the North Pole and Columbia and is fairly well developed from a vertical shaft and adit levels; it is also equipped with a concentrating mill that was erected 14 or 15 years ago. It has ore of the same type as that of the North Pole. The property was located in 1886 and during the intervening years it has been owned by Jonathan Bourne, though Ladd & Tilton, bankers of Portland, are now reported to be most heavily interested. Ten to twelve years ago the mine and mill were operated by Mr. Longmaid, as lessee, who had fair success. Operations since then have been attended by various difficulties and the property is now closed, though it is considered that it has good orebodies and that successful operating is within the possibilities.

Mine and Mill of Columbia Gold Mining Co., near Sumpter, Oregon.

The Columbia G. M. Co. is a close corporation, all the shares in which are held by Edward W. Backus and Wm. F. Brooks of Minneapolis and Frank S. Bailie of Sumpter, Oregon. Mr. Bailie is manager, and all the development, construction work, and production accomplished within the last 14 years have been under his personal direction. During 1909, there were mined and milled 17,165 tons of ore of an average value of $11.13 per ton, the cost of operating having been $5.25 per ton, distributed as follows: Assaying, 10c.; general expense, 5c.; office expense, 10c.; insurance and taxes, 10c.; mining and development, $3; crushing, amalgamating, and concentrating, 80c.; cyanide treatment in tailing plant, $1.10. Aside from the mill production there was a shipment of one carload of ore direct to the smelting plant which returned $364 per ton. In the milling processes 35% of the total extraction is made on the amalgamating plates, 50% by concentration, the balance by cyanidation in the tailing plant. The ore consists of quartz carrying gold, silver, and iron sulphide; it contains, probably, 90% silica. Copper, antimony, and arsenic occur in unimportant percentages. The Columbia is, in the main, a gold mine, the ore containing one ounce gold to three ounces silver. The tailing from the concentrators passes to the cyanide plant by a launder. The sand and slime are separated by means of hydraulic classifiers; the sand is leached in percolating vats, the slime being cyanided in agitation tanks of the company's design. The concentrate, which averages $80 per ton, is hauled 7 miles to the railroad at Sumpter and shipped to the Tacoma smelter.

The mine is opened to a depth of 918 ft. by a 3-compartment, vertical shaft, that was sunk in the hanging wall. The vein, which has a dip of 80°, between argillite walls, varies in width from 5 to 75 ft. The foot-wall is well defined, and most of the ore is found next to it; the hanging wall is not so distinct. While the vein is continuous and defined, the ore occurs in lenticular bodies, extending horizontally along the strike and in contact with the foot-wall. These lenses of ore average, approximately, 4 ft. in width. The shaft stations are 100 ft. apart, a cross-cut from each station opening the vein and establishing a working level. Extensive driving has been done on the vein from all stations, and in opposite directions from the shaft. In this manner the vein has been opened for 3000 ft. on the company's ground. At present ore is being taken from the 100, 400, and 500-ft. levels, as well as some from No. 2 and 3 adits, by which the ground higher than the collar of the shaft is developed. It is estimated that 300,000 tons of ten-dollar ore are exposed by present development. Electric power, purchased from the Eastern Oregon Light & Power Co., serves to operate the hoist, pumps, and mill machinery. The air-

compressor is operated by water-power. The surplus water in the mine is handled by Aldrich electric pumps, placed at the 700-ft. station, lifting 500 gal. per minute; and by auxiliary pumps at the 500-ft. station. Hand-drilling is in vogue here, principally because the exhaust oil from machine drills made some of the ore greasy and this condition interfered with amalgamation on the plates. Whistle signals, instead of bell or flash-light signals, are in use. The whistle is attached to the air-receiver at the collar of the shaft, and the receiver is connected with the air-compressor. It is blown by pulling a cord at any station in the mine. This and other mines of Cracker Creek district are in the National Forest, and therefore the cutting of timber for mine uses is subject to the regulations and prices established by the Forest Service.

The Northwest Smelting & Refining Co., which owns the Sumpter smelting plant, is expected to start operating some time this season, according to the plans of F. W. Scofield, the manager, who states that he is now receiving ore for custom work. The plant has a 44 by 140-in. copper furnace, and is said to be in good physical condition. Mr. Scofield figures on obtaining silicious ore from the Sumpter district and iron and copper sulphide ore from the Iron Dyke mine on the Snake river. This smelter operated part of 1905 and 1906, during which period it is stated to have produced and shipped 41,000 oz. gold and 150,000 oz. silver, from ores mined in this section.

FREIGHT RATES FROM THE COEUR D'ALENE DISTRICT

In connection with the complaint of the Pennsylvania Smelting Co. before the Interstate Commerce Commission, some interesting facts were brought out relative to the movement of lead concentrate. It appears from the summary by J. C. Clements, the Commissioner who heard this case, that the rate charged for the transportation of ore and concentrate from the Coeur d'Alene district to both Carnegie, Pa., and Atlantic Coast points is $12 per net ton, though the haul to Carnegie is about 440 miles less than the haul to the Atlantic Coast points. From all other points in the United States where such products originate, the rates are, as a general rule, 60c. per ton less to Carnegie than to New York. The complainant corporation alleged that the rate of $12 was in violation of the act to regulate commerce, and asked that a differential of 60c. per 2000 lb. be allowed Carnegie so that the rate would be $11.40 per ton. The defendant railway companies relied only on one defense, namely, that the $12 rate to the Atlantic Coast points was made necessary through water competition, and was extended westward as a blanket rate as far as Chicago, and that under the circumstances a higher rate to Carnegie might with perfect propriety be established. In support of the contention that the $12 rate to the Atlantic Coast points was compelled by water competition, evidence in the form of two shipments of pig lead from San Francisco to New York by water was presented, which shows that there was charged, respectively, $4 and $5 per ton. The rate from the Coeur d'Alene district to San Francisco by rail and water is $5.50 per ton, which would make the entire rate upon these shipments from the Coeur d'Alene district to New York by water and rail $9.50 and $10.50 per ton, respectively. But this defense was destroyed, as the defendants in a Great Northern tariff published a rate on pig lead from Seattle, Everett, and Tacoma to Carnegie of $12.10 per ton, and to New York $12.70 per ton, there being a differential of 60c. in favor of Carnegie. Moreover, from the testimony it appeared that the complainant is the only smelter and refiner of lead ore and concentrate between Chicago and the Atlantic coast, and therefore the only one affected by the rate in question. One of its competitors has a smelter at Perth Amboy, N. J., and obtains the same rate upon ore as complainant. It is asserted that the Perth Amboy smelter is owned by the same corporation which owns smelters at East Helena, Montana, and various other places. It further appears that these smelters situated at Perth Amboy and East Helena can lay down pig lead at any point in the United States at a much less freight rate than complainant. For instance, the smelter at East Helena can haul 55% lead ore from the Coeur d'Alene district to East Helena, there smelt it, and deliver the bullion to Pittsburg at a freight rate amounting to $9.40 per ton less than the complainant can haul the same ore from the same originating territory and deliver it in Pittsburg which is eight miles from Carnegie and practically the home city of complainant. When 75% ore is hauled the East Helena smelter can lay down the product in Pittsburg at a rate amounting to $4.65 per ton less than the complainant. Apparently the complainant can compete more favorably when it buys high-grade ore than low-grade ore; this being due to the fact that, while the rate on the ore is a little lower than that applied on the product, the greater tonnage of the ore makes the rate applied thereon commensurately higher. Why it should be handicapped in drawing its supply of ore from the Coeur d'Alene district is not of record. The railways were therefore required to establish and maintain a rate from the points in the Coeur d'Alene district to Carnegie, Pa., not in excess of $11.40 per ton, or of 95% of the rate contemporaneously charged to Perth Amboy, N. J., and other points now taking the $12 rate.

USEFUL WATER TABLE

The following compilation will be of use to those who wish to know the relation that head and volume of water bears to the size of nozzle that may be employed to best advantage:

Head	Miner's inches.				
feet.	2-in. nozzle.	2½ in.	3 in.	4 in.	5 in.
100	80	125	185	322	500
150	100	155	225	400	625
200	115	180	260	460	715
250	130	200	290	515	800
300	140	220	320	565	880
350	140	240	345	610	950
400	150	255	365	650	1,000

The miner's inch as established by legislative act in several of the Western States is 1½ cubic feet per minute.

Hydraulicking in Trinity County, California

Trinity, Siskiyou, Humboldt and Del Norte counties in northern California, are not affected by the laws inhibiting hydraulic mining, as the drainage of those counties is not tributary to the Sacramento river, but is to the westward directly to the Pacific. As a consequence large hydraulicking operations are still carried on. The largest mine is the La Grange, five miles west of Weaverville, at the head of Oregon gulch. The geological conditions are described by D. F. MacDonald, in the advanced sheets of 'Contributions to Economic Geology for 1909.'*

The deposit at the La Grange mine is part of an old channel formed by Stewarts Fork or by Trinity river. From rim to rim the width of this channel is almost a mile and its greatest depth is 600 feet. Its direction here is determined by its northern rim, which is a great, smooth, slickensided fault-plane trending N. 70° E. and dipping 22° S., and the striae on which make a small angle with the horizontal. Along this fault a parting of sticky clay, a few feet thick, separates the gray schistose rock on the north from the dark, slaty, rough-surfaced bedrock on the south side. The stratification of the gravel along this plane is much disturbed. The wash contains a great variety of rock; about 12% of it consists of boulders weighing from 100 pounds to many tons. Near the lower part of this bed is a lens-shaped layer of cement gravel, having a maximum thickness of 50 feet. Below this indurated bed uncemented stratified wash rests unconformably on an older blue gravel.

A maximum flow of 3400 miner's inches of water is conveyed to this mine from Stewarts Fork, 29 miles distant. From a reservoir eight and a half miles of flume brings the water to the first inverted siphon, which has a span of 4800 feet with an 1100-ft. depression and is of 30-in. steel pipe with lower lengths one-half inch thick. Beyond this siphon there is a 9000-ft. tunnel, two inverted siphons, one with 150 ft. difference between head and discharge, the other with 60, and a flume and ditch leading to the reservoir at the penstock. The flume, 2 ft. wide in the bottom, 6 on top, and 4 deep, is built of 4 by 6-in. framework lined with 1½-in. boards, and cost $5000 to $7000 a mile, the tunnel $10 a running foot.

From the penstocks three main pipe lines carry the water to six giants working under 450 to 650 ft. of head, and three of these, together with a smaller one, work at once. The largest pipe is 30 in., the smallest 15; the gauge is No. 4 to No. 7. The mains have 15 to 18-in. inlets and 5 to 9-in. nozzles and are fitted with safety clutches, invented by Pierre Bouery, the manager, to prevent accident in case the kingbolt should snap and the top of the giant break loose. These giants are fitted with a modified form of 'bootleg' deflector and with saddles, so that the piper rides the swinging pipe and has it under control at all times with minimum exertion and maximum safety and efficiency. The reservoir gates are fitted with automatic floaters for regulating the discharge so that the same amount of water a minute will flow whether the reservoir is full and the pressure great or the reservoir nearly empty and the pressure correspondingly low.

In mining, the 600-ft. bank is usually undercut along the bottom and slowly crushes down, breaking even the cement gravel near the base. This undercutting saves the large blasts formerly necessary, and now only the larger boulders and masses of cement gravel which do not crush small enough are blasted. Large masses of clay are encountered along the main fault plane; these are bored with an Ingersoll wood boring machine, using a 7/8-in. bit, and blasted. The high-pressure pipes accomplish the cleaning of the bedrock, so that scraping is unnecessary. The sluice-boxes are 4 by 6 ft. in cross-section and are set into bedrock cuts. They have a uniform grade of 8 in. per 12 ft. for all except the first 70 boxes, which are set at 7 in. The sluice is lined with 40-lb. steel rails throughout its 3000 ft. of length. The bottom rails are all set crosswise, except a few lengths near the upper end laid lengthwise to help give the material a start. Rails set lengthwise and 8 in. apart last two months; lengthwise and 5 in. apart, four months; crosswise and 5 in. apart, six months. The interval of 5 in. has been adopted for the bottom rails; these are held in place and spaced by cast-iron lugs bolted to one rail and having a square depression in the other end, which fits on the head of the bolt holding the lug to the next rail. The rails may thus be readily removed at clean-up time without unscrewing bolts. They are set on 2 by 6-in. pieces spaced with 4 by 6-in. wooden end and centre blocks, thus forming 10-in. riffles. When the top part is worn off the rails are heated in a special furnace, straightened, and used to line the sides of the boxes. For this lining they are set with the web or stem of the T between thick plank strips and with the flat basal part projecting out over the strips, thus armoring the sides of the sluice. Long bolts passing downward through the strips and rail stems hold them in place. The rails are shipped from San Francisco already drilled and cut in 6-ft. lengths. Each length, with lugs attached, costs at the mine, after paying $1.25 for freight from Redding, about $5. Each of the 140 or more sluice-boxes contains 30 transverse rails. About 1400 ft. from the head of the sluice the material can be diverted by means of a steel door to another part of the dumping ground. This exit gives more dump area and facilitates the clean-up of the lower sluice. Through this iron-clad sluiceway material is washed at the rate of 1000 cu. yd. per hour, boulders up to seven tons in weight being carried through. Formerly the sluice was lined with wooden blocks 16 by 16 by 13 in. These wore so rapidly that a clean-up and relining were necessary every two or three weeks. Sand, too, often gave trouble, and it was difficult to save the fine gold if the sluice was allowed to carry anywhere near its full capacity. With the present equipment the sluice can be run full day and night, and only three clean-ups a year of the first 40 or 50 boxes are necessary.

*Bull. 430-A, U. S. Geol. Survey.

The Black Hills of South Dakota—II

By William H. Storms

As was natural, the placers first attracted attention, and it was this that resulted in the great rush to the Black Hills. The various early expeditions having reported the presence of gold in that region, and these statements having been confirmed by the Jenney-Newton expedition of 1875, thousands of men, women, and children left their homes and hastened to the new El Dorado, and a great many claims were located in the Hills, even before the expedition had completed its labors and left the country. Later these people were taken from the Hills by the soldiers, under orders from Washington. The Indians were about the only serious menace to these pioneers, and many an unfortunate gold-seeker went to his last reward at the hands of the hostile Sioux. Singly and in small parties, more than a hundred men, women, and children perished in the most horrible manner after being captured by the Indians, in or near the Hills. Men at work in the placer pits were always armed, and lived, day and night, in constant fear of an attack from the Sioux. One party with several wagons—men with their families, seeking a new home in the land of gold—were surprised at night in Red Canyon, one of the southern gateways to the Hills, and the entire party was massacred. This sad ending to what must have been the enthusiastic hopes of the members of the party, should have acted as a check on others coming into the Hills, but only taught them greater caution—to send scouts ahead and to the rear, and to have at night guards always on watch. Some fellow, with a bit of sentiment in his make-up, nailed a board to a pine tree by the roadside at the entrance to Red Canyon, on which was painted the following expressive warning:

"Travelers, look to your rifles well,
This is the mouth of Hell—the Red Canyon."

The early comers mined industriously on the several streams of the Central Hills, on French, Spring, Castle, and Rapid creeks, mostly. Gold could be found almost anywhere, it seemed, but unfortunately for the exaggerated hopes of the majority, the places that were rich enough to pay well were not numerous. Nearly all the miners were inexperienced—farmers, small merchants, clerks, and artisans of the Middle West, who had come in search of the sudden fortune that transportation literature and newspaper stories had led them to believe could be had merely for the seeking, with the minimum of work and in the shortest possible time. Among the multitude, however, were many men from the mines of Colorado and Montana, as well as from other mining States, and these quickly introduced the methods and appliances they had learned by experience elsewhere were essential to success, but even these 'old timers' were often disappointed, for they failed to find gold where it should be, while the 'tenderfoot' struck it rich in the most unlooked-for and impossible places. The number of gold seekers was large, but those engaging in business, in agriculture, and in other pursuits, probably equalled the miners in number. The restless horde penetrated everywhere. The beautiful rounded and timbered slopes, and the enchanting parks of the Southern and Central Hills captivated many, and not a canyon, not a gulch or draw, wet or dry, was left untried.

As new discoveries were announced the restless crowd rushed with frantic haste from one new camp to another. Everyone lived at high tension, ready to desert good diggings for those that were reported better, though the promise often failed of fulfilment. From French creek a stampede occurred to Spring creek when gold was found in the latter stream, but the stampeders were scarcely fairly at work on their new claims when word came that very rich diggings had been struck on Castle creek, and away the entire lot scampered, like a lot of frightened sheep. Each fellow acted as though his whole salvation lay in getting there first. A few days later the newer discoveries on Rapid creek resulted in a similar rush from older to the newer discoveries. However, this is one of the alluring features of mining, and always will be. Two parties, more venturesome than others, made their way through the wilderness to the northward with riding and pack animals only, as no wagon could be taken through that trackless forest without great loss of time. One went into the high mountainous country in the northwestern part of the Hills, in what was afterward known as the Nigger Hill district, there being a number of negroes in the party. The other penetrated into the labyrinth of canyons, rugged ridges and peaks lying to the northward of a high mountain known as Terry peak. Both of these parties were fortunate in finding rich diggings. The one stopping north of Terry peak, known as the Gordon party, included a number of miners from Montana. One afternoon some of their horses strayed and the men, taking the trail, followed the animals along a ridge and down a small narrow gulch (afterward known as Slaughter-house gulch), into the canyon of Deadwood creek, where the horses were found and they went into camp. Notwithstanding the fact that the gulch was an almost impenetrable thicket of dead and living timber—spruce, pine, and aspen, some of the men began prospecting on the bars as was their custom. From shallow holes several feet above bedrock, few pans yielded less than 2 cents and some, with depth, as high as 50. This was better than any of them had been able to find in the gulches of the Southern Hills, and prospecting was continued with vigor, the hardy fellows sticking to the work although provisions were running discouragingly low, and they were eventually reduced to 'venison straight,' before they could renew the supply, notwithstanding the fact that they had enough gold in their buckskin sacks to have bought several tons of provisions. The pay was found better on the bedrock of the bar, and the bed of the creek was surprisingly rich. Claims were quickly staked out, up and down the creek, and a mining district formed, called the Lost Horse District, which was afterward changed to Lost District.

The news of the discovery on Deadwood spread rapidly and soon hundreds and eventually thousands flocked to Deadwood gulch. The first wagons to enter the gulch came in about two miles below the site of the town which was built at the forks of Deadwood and Whitewood creeks. These wagons were let down the mountain side by means of ropes

Deadwood, South Dakota, Looking North in 1880.

The Cambrian (Deadwood) Formation, Deadwood, South Dakota.
(From Darton, U. S. Geol. Survey.)

snubbed around good-sized trees. For the most part the hillsides above the town were covered with dead timber, both standing and fallen, and it was this fact that suggested the appropriate name of Deadwood for the gulch, and the town was named after it. The date of the discovery by the Gordon party was late in 1875. One of the early comers into this district wrote to W. P. Jenney a letter, descriptive of the placers of which the following is an abstract:

"We have made locations on Whitewood, a large stream that rises on the northeast side of Terry's peak and runs down to the Belle Fourche. Starting where the creek runs out of the canyon into the low lands up it to the west fork, or Deadwood, as it is called, there are no better paying mines for a poor man in the Hills. The ground prospects in the creek and on the bars all the way down to bedrock, an average of about 2 cents per pan in fine gold. It is said to be the same on Deadwood. The extent of the claims on these creeks, from the foothills on Whitewood, and up Deadwood, makes a distance of 25 miles, all good mining ground. A small gulch running into Deadwood, called Blacktail, is said to be

good. These mines will certainly pay from $10 to $20 a day to the man when worked in the spring. They are easily opened, for the bedrock is not deep, like it is on Spring and Castle creeks."

This letter was written on January 31, 1876, when little more was known of the district than that gold could be found throughout the length of these streams, and that in some places it was richer than in others. Custer City, a new town of several thousand people, was all but depopulated when the news of the discoveries on Deadwood reached the place, while within a marvelously short time Deadwood became a town of over 4000 population. The Wheeler brothers located the first claim below discovery on Deadwood gulch. At that place the bottom of the canyon was from 200 to 300 ft. in width, and the depth of the gravel, from 2 to 4 ft. This claim was one of the richest on Deadwood and worked with two strings of parallel sluices, produced, it was said, over $200,000. Other claims, both above and below discovery, did almost as well, while still others proved to be disappointing, the difference being due to various causes, among them being the direction of strike of bedrock relative to the direction of the stream at that point, the character of the bedrock itself, width of the canyon bed, more gold usually being found where the gulch was wide than where it was narrow. The grade of the stream was also important, for where it was steep little gold was found, the surface of the bedrock being too smooth to hold the gold. If any were found it would be in the crevices between the various blocks. Then, too, at some places there was found an accumulation of cemented bedrock material lying anywhere from on the surface of the bedrock to several feet above it. These deposits were of local occurrence, though quite frequent for from three-quarters of a mile to a mile or more below discovery. They were formed by ferric iron which issued from pyritiferous veins crossing the creek, cementing the rock fragments into a solid rock mass. Often this material was found to be gold bearing and its upper surface constituted a good bedrock for holding any gold which chanced to be carried over it. The miners called this 'false bedrock,' after the real character of the cemented material was recognized, but generally the 'true bedrock' beneath was far richer. These facts led to some interesting episodes, reference to which will be made later.

Whitewood gulch, below its confluence with Gold Run; the latter gulch itself; Deadwood gulch and its tributaries—Blacktail, Hidden Treasure, and Sawpit, on the west side, and Bobtail and Poorman on the east side, were the richest large gulches in the entire Black Hills region, though in the Nigger Hill region some very rich, but less extensive diggings were found. All of the gulches of the former system head in the region about the Homestake belt, as it is called, and have derived their gold, either directly from the ore deposits of those schists, or, like Hidden Treasure, Bobtail, Deadwood, Gold Run, and Blacktail gulches, have cut through the Cambrian conglomerates and into the Algonkian schists beneath, being thus doubly enriched.

The early-day miners understood the occurrence of gold in the beds of the streams in the Deadwood district, and also realized the true character of the bar deposits, but they did not, at first, fully comprehend the nature of the auriferous-conglomerate deposits. One of the first of these to be worked, capped a hill on the south side of Deadwood gulch, near Central City, and was known as the Alpha mine. The gravel here was less firmly cemented in this deposit than in some of the others in the vicinity, and the deposit was naturally presumed to be a 'high bar' of Deadwood. On the opposite side of Deadwood gulch, and tributary to Hidden Treasure, were found similar deposits, some of which also resembled high bars, and like the Alpha, were presumed to be such, among them being the deposits of the Aurora, Keets, Wooley, and Picacho, though the largest deposit, in the Hidden Treasure mine, dipped northerly into the hill and was covered with quartzite, shale, and sandstone. This deposit passed entirely through the hill, outcropping again, lower down, on the south side of Blacktail gulch, in the Esmeralda and adjoining mines. Still farther northward, on the opposite side of Blacktail, what appeared to be the same conglomerate bed, could be seen capped with quartzite and 'porphyry,' and dipping into a high mountain. This was the conglomerate at the base of the Cambrian, to which extended reference has already been made. The miners could not, at first, comprehend the geology of this deposit, nor did it interest them particularly. Some thought it to be the channel of an ancient river, similar to those found in California, but the main thing was that it paid—was rich, and paid handsomely. The first mills built in the Black Hills were for treatment of these conglomerates, and a number of them were kept steadily and profitably employed for several years. This series of deposits, which had a common genesis and which at one time constituted a single sheet, had been divided in irregular patches by the erosion of the several gulches of the region and these segregated deposits constituted numerous mining claims, the most important of which were those already named, together with those on the north side of Blacktail gulch—the Gustin and Minerva, and the conglomerate deposits as a whole came to be known as the Gustin belt. The ore from some of these claims was the richest ever found in large bodies in the Black Hills. I saw slabs ripped up from bedrock in the Hidden Treasure mine that showed at least $100 in nuggets of gold, some of which were worth as high as $5, while the rock was liberally sprinkled with little pieces worth from 50 cents to a dollar. The deposit in the Gustin-Minerva section is either faulted or intersected by a mass of eruptive rock, but the conglomerate continues northward beyond this disturbance, and may be seen in the neighborhood of the head of City Creek, and along Howard gulch, on the east side of Sheep mountain, 2½ miles northwest of Deadwood. The conglomerate is here gold bearing also, but to what extent I am unable to say.

Erosion has accomplished some strange things in the vicinity of Deadwood. Just east of the town a steep mountain, capped with limestone, and known

as White Rocks rises 1000 ft. above the bottom of the canyon. From its summit a splendid view of the surrounding country may be obtained. On every side rise high hills having either gentle slopes or rugged precipitous sides, the various formations having a controlling influence on the topography. This is shown in the accompanying illustration of the Cambrian bluff at Deadwood. Almost directly eastward and three to six miles distant, is a broad U-shaped valley, through which meanders a small stream called Boulder creek, which runs for several miles through limestone, the erosion never having cut deep enough to expose even the top of the Cambrian.

The general direction, the form, and grade of this limestone valley give it the appearance of having been, at one time, the outlet of Whitewood creek, which, in my opinion, it actually was, but the occurrence of a fault crossing the course of Whitewood creek two miles below the city of Deadwood, may be responsible for the change in the direction of the stream, for a few hundred yards above the crossing of this fault line the Whitewood takes an abrupt turn to the westward and is seen to have cut its way down through the Carboniferous, Silurian, and Cambrian, almost to the Algonkian, making a second exposure of those rocks within a distance of two miles, its bed being about 100 ft. lower than the valley of Boulder creek. In proof of this theory, it may be cited that the bed of Boulder creek and the bars along its course are wholly composed of gravel from the crystalline area of the Algonkian, though, as previously stated, Boulder creek is wholly in limestone, and so, too, are its tributaries, and this detritus from the Algonkian could only have reached its present position by way of Whitewood creek, when that stream flowed through the valley of the Boulder. Furthermore, this gravel of Boulder creek is gold bearing, as may have been suspected, when the character of the material is considered.

The activities of these early-day miners in Deadwood and Whitewood gulches and their tributaries, resulted in the prompt discovery of the great ore deposits which were the source of all the gold, both in the ancient shore-line conglomerates and in the more recent placers—stream beds and bars, alike, these latter often representing two or more periods of deposition. The Cambrian conglomerates may be considered as representing the oldest placer deposits in the world, unless conglomerates can be shown to be auriferous in some pre-Cambrian formation.

One of the first quartz-vein discoveries made in the Hills was that called the Father De Smet, named after a Jesuit priest who for years had lived among the Sioux and had endeavored to enlighten them with the teachings of the Gospel. He had also, so it was said, cautioned the Indians to say nothing of the yellow metal found in the rocks and in the stream beds, as, if it came to the knowledge of the white men, they would quickly overrun the country and the Sioux would lose their beautiful mountain hunting grounds. Father De Smet was correct, for no sooner did the white man learn that gold was to be found there than he began to appropriate the land.

Analytic Work at Copper Queen Smelter

The analytic work of the Copper Queen smelter at Douglas, Arizona, is done under the direction of Percy Butler. The facilities are superior, both as to the laboratory building and its equipment. A large separate structure is provided, which is divided into numerous rooms, protected against dust and draught, well ventilated, and superbly lighted. The routine samples for furnace control are here determined, and also the large number of samples of custom ores are assayed and analyzed.

In making assays a preliminary 1/10 assay ton charge on all unknown ores is run in order to work out the appropriate flux. The amount of nitre (KNO_3) required is determined by multiplying the weight of the button obtained by 5, subtracting 22, and dividing the remainder by 4½. This gives the grams of nitre needed for the excess of sulphur, so that the resulting button shall weigh 22 gm. When the sulphur is high silica is added, and if the silver content is suspected to be high, borax is introduced to insure an acid slag. If much copper sulphide be present an excess of PbO is provided. Every ore is assayed in duplicate, two assays each being made of the original and of the duplicate sample. Unless three of these agree within the limits of experimental error new samples are taken and re-assayed. The charge in the crucible is always covered with a non-reducer, which consists of bicarbonate of soda 8 parts, potassium carbonate 8, and raw borax 4. Part of the above is also mixed with the charge. The reducer used consists of the same flux containing an addition of 4 parts of flour. A typical charge for oxidized ores is as follows:

Ore	½	A.T.
PbO	76	gm.
Reducer	8½	"
Non-reducer	17½	"

This is mixed and covered with 8 gm. of non-reducer. The oxide ores may be represented by the converter lining used, which shows on analysis:

	Per cent.
Silica	80 to 85
Iron (FeO)	3
Alumina	3
Lime (CaO)	1
Copper	= 2

The sulphide ores have the following approximate composition:

	Per cent
Silica	26
Fe (metallic)	28
Lime (CaO)	2
Sulphur	22 to 23
Alumina	6

A normal assay charge for these ores is:

	Grams.
PbO	100
Non reducer	17½
Silica	4
Nitre	13
Cover of non reducer	8

By using an excess of PbO (from 100 to 120 gm.),

with nitre in correct amount to give the required button, enough copper can be driven into the slag, even if as much as 10% Cu be present, to give a button which on cupellation will yield a nice feathered litharge, reducing the absorption and keeping the volatilization very low. A comparatively soft cupel is used. Cupellation is begun at a low temperature, feathering from the start, and this continues until it is close to the button. The finish is made at a high temperature. Dry-wood blocks are placed in the muffle-mouth to open the button after melting. The heat is carefully regulated throughout, oil being used as fuel.

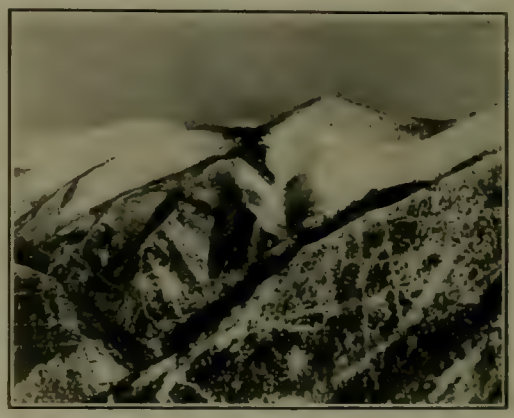
The determination of gold and silver in the copper bullion is done as follows: one assay ton in duplicate is weighed into a 16-oz. beaker, and 20 c.c. of a solution of mercuric nitrate is added. This is made by weighing 20 gm. of mercury and dissolving in 8 c.c. of HNO_3; it is boiled until neutral, so that a small amount of basic nitrate of mercury will precipitate on the addition of water. This is made up to 2200 c.c. with water. Take 25 c.c. of this with a pipette, and cover the bullion with it. This amalgamates the bullion. Add 80 c.c. of strong H_2SO_4 and boil to fuming. The copper goes into the solution and the gold and silver remain undissolved. Take up the copper sulphates with water, and when partly in solution add hot water. To collect the gold and silver add a small portion of lead acetate solution, and before filtering add 1 drop of HCl+Aq, half and half, as a precaution. Filter through double paper, and scorify the paper with test-lead and borax, aiming at an 18-gm. button, which is then cupelled. The results are from 0.04 to 0.08 oz. per ton higher by this sulphuric acid method than are obtained with the old nitric acid method. The copper bullion samples are taken by saw-cuts from a sample pig poured from each converter charge. The saw-cuts are made by a horizontal band-saw, in opposite directions, extending a trifle over half-way through the bar, the cuts being a fraction of an inch apart.

From the blast-furnaces come two samples daily, namely, a slag and a matte sample. These are composites, that is, they represent the day's run on all furnaces. There is also a 24-hour sample of slag and matte, which is of large size, and is sent to the sampling works for reduction. The analysis of the slag and matte samples is finished and reported within 1½ hours, the substances determined being silica, iron (FeO), alumina, and lime (CaO). The caustic soda method is used for the alumina.

The slag analysis is made as follows: ½ gm., finely ground in an agate mortar, is weighed into a small casserole. It is just wetted with water, a pinch of $KClO_3$ added, and 1 to 1½ c.c. HCl dropped on while agitating the casserole and stirring with a glass rod. It will gelatinize in one minute. It is then evaporated to dryness. This is dissolved with HCl and water, and filtered through an ashless filter paper with quick suction. It is dried, ignited, and the SiO_2 weighed. The filtrate is treated with a slight excess of ammonia and 3 gm. ammonium chloride; the solution is boiled and filtered. The CaO is determined in this in the usual way. The precipitate of ferric and aluminum hydrate is washed by a small jet of water into the original beaker, and 1½ inch of stick caustic soda (Baker's C. P. by alcohol) is boiled in it for 3 minutes. The alumina goes into solution as sodium aluminate. It is filtered through a double filter to retain all the iron. The filtrate is acidified with HCl, and a slight excess of ammonia (determined by phenol-phthalein) with 3 gm. of ammonium chloride, are added; the solution is boiled five or six minutes, and then filtered through a double filter using one ashless paper (No. 589 S. & S.) and one ash paper No. 597. The precipitate on the filter is washed three or four times, then dried and ignited, and the Al_2O_3 weighed. The iron is dissolved through the paper with HCl and titrated with bichromate of potassium, after reducing with stannous chloride and taking up the excess of stannous chloride with mercuric chloride. The time required is 1 hour and 5 minutes.

A GLIMPSE OF THE COEUR D'ALENE

We are indebted to A. E. Robinson for the characteristic view of Coeur d'Alene scenery shown below. The high mountain in the middle is Kellogg Peak near Wardner. Near the lower left-hand corner are the surface workings of the Sullivan, and the ridge in the foreground is partly covered by the Stem-



winder workings. The Bunker Hill claim extends from near Milo creek, in the bottom of the canyon, to the right between the Stemwinder ridge, and the ridge covered with timber lying beyond. The Wardner foot-wall outcrops at a point near the lower Sullivan workings, and runs through the point from which the picture was taken. Numerous traverse and other survey lines can be seen. The peak is almost due south of the point of observation.

Hoisting is done in a mine at Guanajuato, Mexico, in a shaft over 1750 ft. deep in which there is not a stick of timber. The guides are steel hoisting cables fixed at the surface and drawn tight on jack-bars at the bottom. As a matter of course, there is tremendous vibration in these guides, when the bucket is in motion in either direction, but no accidents are reported as a consequence of this. Here is case for the exercise of ingenuity in the tying of these rope-guides to the rock-walls, while not interfering with the passage of the buckets.

British Columbia Mining, 1909

*The value of the mineral output of British Columbia for the year 1909 amounts to $24,443,025, which while less than that of 1906 and 1907 is still considerably greater than that of any previous year. The tonnage of ore mined exclusive of coal was 2,057,713 tons, a decrease from that of 1908 of 25,893 or 1.24%. This was produced by the various districts in the following proportions: Yale Boundary mines 71.03%, West Kootenay Rossland mines 11.55%, East Kootenay, mines in Fort Steele division, 7.28%, Coast, 1.92%, all others, 8.22%. The number of mines from which shipments of ore were made was 89, and of these only 52 shipped more than 100 tons each during the year, while but 32 shipped in excess of 1000 tons each. Of the latter eight were in Nelson mining division, 5 in the Boundary, 5 in Ainsworth, 4 in the Slocan, 3 in the Coast, 3 in Trail Creek (Rossland), 2 in Fort Steele, and one each in Trout Lake and Queen Charlotte divisions.

TOTAL MINERAL PRODUCTION FOR ALL YEARS TO 1909, INCLUSIVE

Gold, placer	$70,673,103
Gold, lode	55,277,687
Total gold	$125,950,790
Silver	29,850,586
Lead	23,259,255
Copper	55,871,893
Other metals	890,699
	$235,823,223
Coal and coke	102,904,261
Building stone, brick, etc.	9,093,100
	$347,820,584

QUANTITY OF MINERAL PRODUCTION FOR 1908 AND 1909.

	1908		1909	
	Quantity.	Value.	Quantity.	Value.
Gold, placer	.....	$647,000	.....	$477,000
Gold, lode	255,582	5,282,880	238,224	4,924,090
Total gold		$5,929,880		$5,401,090
Silver, oz.	2,631,389	1,321,483	2,532,742	1,239,270
Lead, lb.	43,195,733	1,632,799	44,390,346	1,709,259
Copper, lb.	47,274,614	6,240,249	45,597,245	5,918,522
Zinc	.....	270,000	.....	400,000
		$15,394,411		$14,668,141
Coal, tons 2240 lb.	1,677,849	5,872,472	2,006,476	7,022,666
Coke " " "	247,399	1,484,394	258,703	1,552,218
Other materials	.....	1,100,000	.....	1,200,000
Total production		$23,851,277		$24,443,025

The number of men employed were: In metal producing mines, 3037 (2048 below and 989 above ground); in mines not shipping, 217 (136 below and 81 above ground); total, 3254. A mine employing say 12 men for 4 months was credited with an average of 4 men for 12 months, so that the total above given is less than the actual number of men who worked in the mines during the year. The number employed at the coal mines was 6418, including 215 white boys, and 672 Chinese, Japanese, and Indians. The official figures of all employed at the mines of the Province, therefore, give a grand total of 9672.

PRODUCTION OF MINERAL BY DISTRICTS AND DIVISIONS

Districts and Divisions	1908	1909
Cariboo district	$ 355,000	$ 290,000
Cariboo mining division	30,000	12,500
Quesnel mining division	30,000	15,000
Omineca mining division		
Cassiar district		
East Kootenay district		
West Kootenay district		
Ainsworth mining division	422,181	617,140
Nelson mining division	492,876	784,995
Slocan mining division	626,330	964,387
Trail Creek (Rossland)	3,711,392	3,496,604
Other parts	1,800	1,000
Lillooet district	173,333	116,333
Yale district		
Osoyoos, Grand Forks, and Greenwood divisions	7,595,380	7,500,046
Similkameen and Nicola divisions	101,583	225,470
Yale mining division	3,000	2,000
Coast districts (Nanaimo, Alberni, Clayoquot, Quatsino, Victoria)		
Totals	$24,851,277	$24,443,025

The coal produced was mined chiefly by three companies, the Wellington Colliery Co. and the Western Fuel Co., both on Vancouver island, and the Crow's Nest Pass Coal Co., in southeast Kootenay. These companies produced about 88% of the total coal mined. Of the smaller collieries, those on Vancouver island were the Pacific Coast Coal Co.'s mines, with about 70,000 tons, and the Vancouver-Nanaimo, 10,000 tons; in Nicola valley the Nicola Valley Coal & Coke Co., 62,000 tons, and the Diamond Vale Co., 1700 tons; in the Crow's Nest district, the Hosmer and Corbin collieries each produced about 60,000 tons. The gross output of coal was 2,400,600 tons (of 2240 lb.), of which 998,494 was sold for consumption in Canada, 741,648 exported chiefly to the United States; 260,554 burned under colliery boilers; 394,124 used in making coke, and 5782 tons added to stock. The quantity of coke made was 258,703 long tons, of which 210,884 was for consumption in Canada; 40,620 exported, nearly all to the United States, and 7199 added to stock. The production of coal was the largest for any year since coal mining was commenced in the Province; that of coke was second only to that of 1905, when 271,785 long tons were made.

Production of placer gold was $477,000, as against $647,000 in 1908, and this was the smallest amount of any year since 1894. The decreased output was attributable partly to the short water supply last season. The value of lode gold was $4,924,090, a decrease of $358,790, as compared with 1908. Nelson, Boundary, and Coast districts each produced more lode gold, but the decrease in Rossland camp was larger than the total increases of other parts of the

*Advance excerpt from the 'Report of the Minister of Mines for 1909.'

Province. About 86.5% of the lode gold was recovered from smelting copper ores; the remaining 13.5% was from stamp-milling. The stamp-mills operated last year were those of the Hedley Gold Mining Co., at Hedley, 40 stamps; Granite-Poorman mill, near Nelson, 20 stamps; Queen mill, at Sheep Creek, 20 stamps; Nelson division and one or two small mills also in the last-named camp.

The silver produced totaled 2,532,742 oz., a decrease in quantity of 98,647 oz., and in value of $82,213, as compared with 1908. About 98.2% was from silver-lead ores and the remainder from copper-silver ores. The Slocan district, including Ainsworth, Slocan, Slocan City, and Trout Lake divisions, produced about 50% of the total, and Fort Steele division of East Kootenay 23%, all from argentiferous galena ores.

Lead showed a production of 44,396,346 lb., this being an increase of 1,200,613 lb. in quantity, and $76,460 in value over that of 1908. Mines in Fort Steele division, chiefly the St. Eugene, produced nearly 61% of this total; those in Ainsworth and Slocan, 34%, and in Nelson and Trout Lake divisions, 5 per cent.

The amount of copper, placed at 45,597,245 lb., was less in quantity by 1,677,369 lb., and in value by $321,727. These figures do not take in account smelter charges or deductions, but show the copper contained in the ore smelted. There was a slight increase in the Boundary and Nelson divisions, but a heavy falling off in Rossland and the Coast districts. The proportions of production of districts were: Boundary 89.04%, Rossland 7.70, Coast 2.84, and Nelson 0.42%. The average assays of copper in ores of the several districts, based upon copper recovered, were: Boundary, 1.41%; Coast 1.5, and Rossland 0.75 per cent.

No iron ore was shipped and very little mined, there having been no market in 1909 for iron ore from the Province. About 10,000 tons of zinc ore and concentrate was sold in 1909, the zinc content ranging from 38 to 48%. The Lucky Jim was the only mine that shipped zinc ore; it sent out 4700 tons averaging 48% zinc. The Whitewater group, Ainsworth division, produced 4600 tons of zinc concentrate, also containing silver from 15 to 25 oz. per ton. Mills of other mines also produced zinc concentrate, but little of that production was sold.

In building materials, etc., the chief production was in granite and sandstone, brick, pottery, and portland cement. Of the last, 238,000 bbl., valued at $360,000, was manufactured on Vancouver island.

Prominent features of the annual report, other than the statistical tables and accompanying comments on the year of the provincial mineralogist, Wm. Fleet Robertson, are: Accounts of that official of his personal observations in several mining districts—Queen Charlotte islands; the coal mining district in the Crow's Nest country in which there has been much development and production; the important though undeveloped coal areas in the upper Elk River district, computed by D. B. Dowling, of the Geological Survey of Canada, to have an area of 140 sq. mi., and a probable coal content of 100,000,000 tons per square mile; the mineral region in East Kootenay, lying between the Canadian Pacific main line railway, in the north, and the Moyie Lake district, along the Canadian Pacific Railroad Co.'s Crow's Nest branch, to the south; and the Duncan River district and Sheep Creek camp, both in West Kootenay. Several official reports on the explosion at Extension colliery, Vancouver island, in which 32 men lost their lives last October, and diagrams also form part of the Annual Report: Well printed halftone reproductions of photographs are numerous, and some of these are of especial interest, since they illustrate mining and other scenes not previously used in any official report.

WORKING COSTS OF GOLD DREDGING IN CALIFORNIA

By Charles Janin and W. B. Winston

In California, dredging companies determine yardage handled by bank measurement ahead of the dredge. When dredges are working in swift running rivers, as in some foreign countries, it is difficult to determine the yardage handled with the same degree of accuracy that can be computed from careful bank measurement; the method generally employed in such cases is to count the number of buckets dumping within a stated time, making some allowance for buckets only partly filled. Should too large a yardage be figured, it is obvious that the estimated cost per cubic yard will be proportionally too low. Working cost cannot be fairly used in comparison unless uniform methods of determining them are employed, and also unless operating conditions are somewhat similar. Ground in the same locality often varies to such an extent that dredges similar in construction, design, and bucket capacity, and operated under the same management, show at times considerable difference in cost per cubic yard. Nearly all dredging companies operating in California keep careful daily records, though on the dredges owned by individuals the practice of keeping exhaustive records of yardage handled and the segregating of items of working cost is not always followed. It may also be said that in some cases working cost is in a great measure a matter of bookkeeping.

The table opposite showing the operating cost per cubic yard for dredges of different capacity, working in California, has been compiled from records of various dredging companies, with the endeavor to arrive at the total operating cost per cubic yard with some degree of accuracy. The buckets in use in California vary in capacity from 3 to 13½ cu. ft. and will probably soon be made 15 cu. ft. Dredge operators in California prefer the close-connected bucket line to the open-connected type, and the use of digging spuds, to head-lines. In practice the close-connected bucket line dumps at the rate of from 18 to 22 buckets per minute, while the open-connected line averages from 12 to 14 buckets per minute. On some of the older boats where the bucket line has been changed from open to close-connected buckets, it is claimed that the yardage handled has been nearly doubled and the expenses per cubic yard decreased.

WORKING COSTS OF GOLD DREDGING IN CALIFORNIA

Capacity of buckets, cu. ft.	Time in commission	Working period for figures given	Actual working time; hours during working period[1]	Yardage handled	Average depth of gravel, ft.	Operating expenses, in cents per cu. yd. — Labor and material	Electric power	Water	Repairs	General	Taxes and insurance	Total expense[2]	Remarks
3		1 yr.	2,809	173,655	27.0	2.77	0.80	0.14	4.15	0.78	0.49	9.23	Difficult digging
3	5 yr. 9 mo.	"	7,216	458,882	26.9	2.03	0.69	...	3.28	0.63	0.37	7.00	Working under favorable condition
3½	7 yr.	"	....	395,316	35.0	2.83	1.53	0.228	1.74	1.32	..	7.67	
3½	6 yr. 6 mo.	"	7,344	461,882	35.0	2.85	1.18	0.195	1.71	1.07	.	7.32	Compact gravel land subject to overflow
4	9 yr.	"	7,057	484,387	20.6	1.83	0.89	0.31	2.58	0.65	0 26	6.52	Remodeled dredge, uneven bedrock in places shallow
5	6 yr.	"	....	481,184	25.0	3.28	1.46	0.39	2.97	1.52	...	9.55	Difficult ground, in places cemented gravel
5	2 yr. 5 mo.	"	....	635,146	27.0	3.14	1.15	...	2.40	1.28	0.41	8.70	Difficult ground
5	2 yr.	"	....	582,891	30.0	3.28	2.02	0.32	2.59	1.37	1.00	9.60	Difficult digging
5	5 yr. 6 mo.	"	7,344	615,009	25.0	3.06	1.42	0.29	3.06	1.14	..	8.98	Difficult digging
5	4 yr. 6 mo.	"	....	812,355	36.0	2.30[3]	1.08	...	2.95	...	0.35	6.65	Medium gravel with considerable clay bench broad on top soil
5	3 yr. 5 mo.	"	6,798	1,148,480	25.5	0.88	0.52	0.05	1.77	0.25	0.53	3.80	Loose gravel, heavy overburden of sandy loam
5	2 yr. 5 mo.	"	6,790	1,148,802	29.9	0.82	0.49	0.03	1.89	0.25	0.16	3.64	Loose gravel, heavy overburden of sandy loam
7	4 yr. 7 mo.	"	6,644	599,614	38.5	1.77	0.92	0.25	1.03	0.47	0.23	7.67	Difficult digging, working against 20-ft. bank
7	9 mo. 10 days.	"	5,088	838,885	35.0	1.19	0.69	...	1.22	0.26	0.17	3.53	Difficult digging, gravel coarse, partly cemented
7	1 yr.	"	6,313	1,114,605	27.6	1.21	0.62	0.03	1.81	0.29	0.11	4.07	Compact gravel
7	3 yr. 9 mo.	"	6,390	1,033,694	26.5	1.08	0.64	0.14	2.69[4]	0.34	0 20	5.09	Compact gravel, heavy digging
7	2 yr. 9 mo.	"	6,917	1,017,167	28.1	1.10	0.65	0.15	2.19	0.28	0.14	4.51	Compact gravel, heavy digging
7	3 yr.	"	6,352	935,322	33.4	1.26	0.85	0.06	3.06	0.31	0 34	5.88	Compact gravel
7	3 yr.	"	6,700	1,194,146	27.5	1.05	0.58	...	2.78	0.32	0.37	5.10	Compact gravel
7½	2 yr. 11 mo.	2 yr. 11 mo.	13,464	3,458,229	27.9	0.27	0.41	...	1 50	0 24	0.24	4.42[5]	Medium compact bench gravel
7½	9 mo. 6 days.	9 mo. 6 days	5,582	944,879	28.9	0.95	0.58	...	1.30	0.27	0.39	3.55	Medium compact gravel with heavy overburden
7½	2 yr. 6 mo.	1 yr.	6,402	1,369,844	70.2	0.99	0.77	...	1.95	0.45	.	4.16	Medium gravel overlain with hydraulic tailing
7½	2 yr. 6 mo.	"	6,900	1,281,351	67.8	1.09	0.98	...	2.01	0.45	..	4.53	Medium gravel overlain with hydraulic tailing
8	6 mo.	6 mo.	3,162	583,927	42.5	1.69	0.59	...	1.14	0.28	0.22	3.92	Light gravel, dredge working against 10-ft. bank
8	4 mo. 8 days.	4 mo. 8 days	2,369	626,624	24.0			Segregated costs not given				2.47	
9	5 mo.	5 mo.	....	580,310	51.0			" " " "				4.98	Cemented gravel, difficult digging, 20-ft. bank, above water level
13½	8 mo.	8 mo.	4,478	1,803,201	19.0	1.02	0.47	...	0.60	0.12	0.09	2.30	Fine gravel, easy digging

[1] Total possible time in year's work, 8784 hours.
[2] Including general expense, management, etc.
[3] Heavy repair cost due to new tumbler, conveyor belt, repairs to digging ladder, screens, etc.
[4] Replacing tumbler shafts, conveyor belt, and new screen included in repairs.
[5] New steel spud and screen in repairs.
[6] Depreciation charges included in total expense.
[7] A 7-ft. dredge is now working this ground at a profit.
[8] This dredge successfully replaced an open connected bucket dredge which could not handle ground at a profit

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Crushing by Stages

The Editor:

Sir—Most millmen have practised crushing by stages, but not in stamp-mills alone. Every machine has its sphere of usefulness, or its limitations. The rock-breaker of different sizes, for breaking ore between certain sizes, depending upon the physical character of the ore; the stamp-mill for other sizes and the pulping machines, such as Chilean or Huntington and tube-mills for still other sizes. Stamps of weights between 850 and 2000 lb. approach at both ends the limits where the rock-breaker or the fine-grinder is more efficient. The 2000-lb. stamp approaches the rock-breaker, while the 850-lb. stamp comes near the sliming machine. While the complication of machinery would no doubt be profitable in very large mills, for the average small mill it would be out of the question. That portion of the mill where the most expensive grinding takes place (the fine grinding plant) is where this principle might be better applied.

F. Cremer says the mining fraternity is slow in recognizing the efficiency of the principle as illustrated in the conical tube-mill. Maybe the mining fraternity has found the weak points of the conical tube-mill and prefers two cylindrical tubes, sizing between, or crushing in stages instead of in one machine. Mr. Cremer will do a favor if he will point out in what particular the conical tube-mill is more efficient than cylindrical tubes. My idea is that the conical tube has its limitations, just as the stamp-mill has, and for fine grinding, from 100 to 200-mesh, the cylindrical machines properly proportioned are superior.

If in a 5-stamp battery each of the stamps were of different weight and ran at different height of drop and different speed, we would have the same principle as in the conical tube-mill, less the sizing action. The heavy stamps would do most of the work, as is the case in the larger diameter of the conical tube. The question is, to what extent does this sizing action take place. We know that on dry ore with no discharge of ore from the mill, the sizing action of pebble and ore particles is pronounced, but how far does this take place in wet crushing, where a continuous stream is entering and leaving the mill? The pebbles size, of course, but does the ore size, or do the small pebbles have to work on large particles of ore? If so, the principle that Mr. Cremer favors is not found in the conical tube. My experience is that this sizing action on the ore is very imperfect and consequently the small pebble, with its comparatively small amplitude of fall, is in the position of an 850-lb. stamp, taking the size of ore that had better go to the rock-breaker.

ALGERON DEL MAR.

Fort Bidwell, California, July 20.

Lining Old Mill Mortars

The Editor:

Sir—Stamp-mill mortars that have not been provided with 'liners' in the original design, may be lined with cast-iron plates $\frac{1}{2}$ in. to 1 in thickness, or if there is not enough room between the stamp heads and the sides and ends of the mortar box, sheet steel $\frac{1}{4}$ in. thick, may be cut to the proper size and shape, and set in the mortars, thus saving the mortar casting from further wear by abrasion. To accomplish this it may be necessary to change the position of the stamps by substituting guides which bring the stamps closer to each other. If $\frac{3}{4}$-in. clearance between stamp heads can be secured it will be found sufficient, if the guides hold the stamp stems vertically, permitting but little 'play,' for if too loose there is danger of a falling stamp striking one that is being lifted—a thing to be avoided at all times. An additional advantage is gained by increased capacity per stamp if the dies are slightly larger than the shoes, that is, have a greater diameter. This difference should not exceed $\frac{1}{2}$ in., however, or the die is likely to cup badly, thus decreasing, rather than increasing, capacity. To get the best results in stamp-milling the cam-shaft boxes must be carefully lined up, whether babbitted or not, or the shaft will 'jump' with every revolution, and if the boxes be babbitted the condition will be worse than where no babbitt is used, for the shaft will quickly pound the metal to pieces and the fragments are more than likely to fall down into the mortar, and every millman knows the results that follow the introduction of lead and antimony compounds into the stamp-mill mortar.

San Francisco, July 20. MILLMAN.

Cyaniding Sulphides

The Editor:

Sir—There is a subject about which little or nothing has appeared in the technical press. I refer to 'Cyanidation of Sulphides'; and should be pleased to gain some data. It would be a boon to the mining world if those who have been engaged or are at present engaged in treating sulphides, you might say pyrite, by cyanidation would diffuse some knowledge on the subject by giving their experience. There is ample room, I think, for a few articles on the subject, describing fully the kind of sulphide treated, time of contact, strength of solution, aeration, and methods of precipitation. There are some plants in California and Nevada treating their sulphides at home, and information regarding their experience would be useful to those now undertaking the task, as sulphides treated and difficulties to overcome elsewhere may be similar. Instead of shipping to smelters, the treatment of the baser products at home is becoming more in vogue. In most cases it is cheaper, especially at a mine having a cyanide plant. Again, it solves the difficulties and expense of transportation. Any information that may be given from whatever clime will not only add to metallurgical knowledge, but will be greatly appreciated.

INGENIERO KCN.

San Francisco, July 19.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and allied arts.

Coolgardie is derived from a native word, 'Cool garda,' the name of a pool of water the one native well in the vicinity of the famous gold deposits. Kalgoorlie is from 'Kalgorlah,' the native name of a fruit growing in the locality.

When several charges of dynamite are to be exploded simultaneously by electric fuses, it is necessary, unless the electric fuse wires are long enough to reach between the drill holes, to join them with insulated copper connecting wire.

The coefficient of friction at low journal speeds is high, but decreases as speed is increased. It varies approximately as the square root of the speed. Also, friction is much greater at low, or ordinary temperature (60°) than at 100° or more.

The Parkfield district of California, situated in the Cholame valley, between the Mount Diablo and Temblor ranges, is connected with the San Joaquin valley at its junction with Antelope valley, and is fourteen miles south of Coalinga. Wild-cat oil wells are being drilled in it.

The only advantage in employing a 48-in. 'drum' on a gravity tramway, in place of one 36 in. diam. is that the cars may be more readily controlled by brake with the former than the latter. It is also somewhat better for the rope, as it will not make so short a bend.

Steel in various forms has been employed in mines for the support of roofs, old T-rails having frequently been used for this purpose years ago. Generally steel I-beams have been used in this way, until now, special forms of the I and channel type are made for use in mines.

Gold in a stream will not lodge where the fall of the stream is heavy, that is, much over 100 ft. per mile. In such instances the rapid current carried along all of the detritus, gold included, generally leaving the bedrock smooth and hard. If gold has passed over such a place, it will lodge only in crevices down into which it sometimes works to the depths of several feet. When heavy grades are met in an auriferous stream, prospective investors would do well to use much caution.

Deposits of high-grade soda exist in various places in Wyoming in the beds of dry lakes or ponds. They range from a few feet in diameter to some that cover several hundred acres. Most of these alkali deposits, though lying at different elevations above the sea, seem to have a common origin and occur in all parts of the State. In some localities the amount of alkali stored in clays and shales is enormous. For example, in the midst of the Red desert there are clay beds of a dull red color which have rather a pulverulent surface during dry weather, though a few inches below the surface in many places the alkali amounts to 30 or 40% of the mass. When there is a slight rainfall the clay forms a protective covering and little of the alkali is carried away.

Tests of rain gauges are being conducted at Ithaca by the New York State Water Supply Commission and show that the difference in registration between different types is not great. If the registration of a U. S. Weather Bureau gauge is called 100, Walter McCulloh, chief engineer of the Commission, reports that the registration of a Smithsonian gauge on the ground will be 101.7, that of a Fuertes gauge 102.1, that of a Dewitt conical gauge 98.4, that of a Smithsonian gauge 10 ft. above ground 105.2, that of a Fuertes gauge 10 ft. in the same position 104.3, and that of a Dewitt conical gauge 96.6.

Tungsten filaments are commonly made by mixing the metal in a paste that is then extruded in the form of a filament, after which the paste is expelled and the particles of metal are welded together by an electric current. This complicated method is due to the fact that tungsten is not sufficiently ductile to be drawn out into fine filaments. An English concern has just discovered a method of producing drawn filaments of tungsten, and the General Electric Co. has also just announced the discovery of a method by which tungsten may be rendered sufficiently ductile to permit of its being drawn into fine wires. The drawn tungsten filament is stronger than the filament made by the sintering process.

In the Lehigh Coal & Navigation Co.'s property near Summit Hill, Pennsylvania, a fire has been burning continuously since February 1859, resisting all efforts to extinguish it. It was finally determined to cut a channel through the coal from floor to roof of the coal-seam, which is 50 ft. thick, and to fill the cutting with clay. This barrier will probably stop the further advance of the fire, as there will be nothing for it to feed upon. In Wyoming, on Powder river, coal veins are burning which have been on fire as far back as the oldest explorers of the region have any knowledge, and these subterranean fires have burned out a vast area, turning the clay shale to hard jasper, and making of the surface a veritable desert bad lands.

Exhaust of pumps operated by compressed air will not ordinarily freeze if the air outlet be of large size, but often pumps which have been designed for operation by steam are connected with the compressed-air line, in the mine, and such pumps are more than likely to freeze at the exhaust. This can be prevented if the main water-discharge column be tapped about 10 ft. above the pump and a ¼-in. pipe be inserted, this small pipe to be extended to the air exhaust of the pump, and the end of the pipe drawn down to about one-sixteenth inch. The jet of water from this little nozzle should be directed into the exhaust opening, when it will be found that the exhaust will not freeze. In some cases it is sufficient to allow the stream of water from the little pipe to merely drip down on the exhaust port of the pump. If this latter fails to prevent the pump freezing the former method will not.

Special Correspondence

LONDON

Coal Dust Burner. — New Einasleigh Mine.—Talisman.— Great Boulder.

Many attempts are made from time to time with the object of using coal dust for steam-raising purposes. There are two reasons why such a method of combustion is advantageous; first, the air is more efficiently mixed with the coal, and second, fuel that has hitherto been wasted, can be utilized. Many practical difficulties have stood in the way of success, chiefly the production of too high temperatures locally. The design of the Bettington-Robeson boiler which is now being introduced in England and South Africa, diminishes these disadvantages. It is of the vertical type and consists of top and bottom drums connected with three sets of vertical tubes arranged in concentric rings close together. The central, upright, cylindrical space is wide and a lining of firebrick is built against the inner set of tubes. The burner is at the centre at the bottom and the current of dust and air on ignition flows direct up the centre and impinging on the top drum turns toward the outside and travels downward in contact with the firebrick. On arrival at the bottom it passes below the firebrick and comes in contact with the tubes for the first time. It travels up by the inner set and down again in contact with the outer set and finally the gases are discharged through an economizer for heating the feedwater and subsequently through a heater for heating the air led to the burner. The inside lining of firebrick is intended to protect the first tubes, which in their turn abstract heat from the brick and prevent it from melting. The burner is also water-jacketed and the water circulating through it is used as feed. The heat obtained is so great that the ash of the coal falls in a molten condition. The pulverizer and fan are one and the same machine, the coal being fed through a hopper and pulverized by the blades of the fan. The air and dust first go into a chamber where the coarser particles of coal settle and then through the heater and on to the burner. The blades of the fan can be regulated so as to vary the amount of air drawn in. The draught through the boiler is supplied by this fan and the height of the chimney is determined solely with a view of getting rid of the products of combustion.

The New Einasleigh copper mine in Queensland is turning out to be a valuable property. The mine is owned by an English company which was formed in 1907, and the control is with the same group as British Broken Hill, W. H. Woodhead being the leading spirit. The development has been devoted to opening the third and fourth levels. At the third level a cross-cut was driven, and intersected the lode at 254 ft. The vein was here found to be 47½ ft. wide, averaging 8% copper. A drift to the north passed through 88 ft. of ore and then opened a faulted zone. Subsequently the lode was found again and as driving was continued the content gradually increasing to 8½%. By diamond-drilling at the end of the working it was shown that the lode was 61 ft. thick averaging 6% copper. A south drift on this level was carired 75 ft. through 6½% ore and at a point 30 ft. from the cross-cut a winze was sunk 90 ft. in ore of the same grade. On the fourth level the lode was intersected at 324 ft. from the shaft and was found to be 30 ft. wide averaging 9%. A north drift passed through 30 ft. of 8% ore, and a south drift after passing through broken country found the lode, exposing ore which averaged 7% copper for 37 ft. The manager has estimated that the ore reserve on January 31 was 141,500 tons, half of it averaging 8% and half 4%. A recent cable announces that additional ore estimated at 77,000 tons had been developed, bringing the total reserve to 218,500 tons. In order to test the smelting qualities of the ore 15,000 tons was sold to the Chillagoe company. By this sale the development expenses have been met. A concentrating plant capable of treating 150 tons per day has been built. This includes a unit of Elmore vacuum plant and Wilfley tables which are to be tried against each other on the fine portions of the ore. The directors say that the cost of treatment of the former will be greater than that of the latter, but at the same time the recovery will be higher.

The Talisman is a gold mine situated near Karangahake, in the Province of Auckland, New Zealand, and is managed by Bewick, Moreing & Co. Dividends were first paid in 1906 when £30,000 were distributed. During succeeding years the dividends have been £60,000, £90,000, £108,750, and £120,000, showing a satisfactory progress in profits. The latest report discloses a most encouraging state of affairs, due to the discovery of high-grade ore in the lowest level. During the year ended February 28, the 50-stamp mill treated 44,800 tons and the yield by amalgamation and cyanidation was 46,553 oz. gold and 234,200 oz. silver, being over 1 oz. gold and 5 oz. silver per ton, and an extraction of 95% of the gold and 75% of the silver. At the beginning of 1910 three tube-mills were started,

but defects in their construction have prevented them getting to regular work. During the last two years many new additions have been made to the plant, among which pumps for coping with the great inflow of water take a prominent part. The cost has been provided so far out of revenue, and it is the intention of the directors to provide further funds for capital expenditure by issuing 45,000 new shares at 25s. each. The figures for reserve on February 28, given in the engineer's report, have been rendered out of date by subsequent discoveries on the thirteenth level. At the meeting of shareholders the chairman announced that recent discoveries had disclosed ore with average content above that of the ore treated during the past year. The orebodies are variable and their value difficult to estimate, as the figures vary from ½ to 500 oz. The mine appears to have several prosperous years before it.

The Great Boulder Proprietary undoubtedly deserves to be called the premier mine of Western Australia and during the 15 years of its life has produced gold worth more than £6,500,000. The report for 1909 shows that 187,755 tons of sulpho-telluride ore was treated in the stamp-mill, yielding by amalgamation bullion valued at £227,317; and by cyanidation bullion valued at £366,366, a total of £593,683. The costs were as follows: development £38,329, amount developed 207,406 tons at a rate of 3s. 8d. per ton;

mining $2.143 or $8.64 per ton of ore mined, milling and roasting $2.783 or $9.134 per ton, crushing $.222 or $.91 per ton, general charges and smelting $1.76 bringing the total cost to $4.75 or $20 per ton. These ores are of 2240 lb. so the working cost per 2000 lb is $4. Office expenses in London and Adelaide, absorbed profits taxes $20,000 and depreciation $4,000 $24,000 has been distributed as dividend. The ore reserve on December 31 was 1,097 tons averaging 9 dwt which is 1 dwt more than the content of the ore treated during 1909. The main shaft is now down 2,300 ft and the Edwards 2,017 ft they have been connected at the 2,150 ft level. The east end of the former ground is in the 2,200 ft level the average being 25 dwt and the ore in the 1,950 ft level is as good as any found in the 1,000 ft above with the exception of this rich ground. The two most important developments on the 2,000 ft level are blocks of ft long of 12 dwt ore 7 ft thick and 54 ft of 13 dwt ore 5 ft wide in the north and south drifts from Edwards shaft. This is a better result than on the 1,600 to 2,050 ft levels where the average has been only 11 dwt. The amount of ore in hand is sufficient to last for four years, and the prospects for further discoveries seem to be good.

BUTTE, MONTANA

Output of Mines.—Heinze Properties.—Ophir.—Parrot Suit.

There has been a great deal of misstatement published about the curtailment of production at the Butte mines. As was stated in these letters a few weeks ago, the curtailment consists of a reduction of ore output amounting possibly to 500 tons per day, made necessary by the purchase of the Clark mines by the Anaconda and the closing of the Clark smelter in Butte. The two Anaconda smelters have not sufficient capacity to handle all the ore that can be mined, or that has been mined for some time. At some of the mines a Sunday rest day has been given the men and this announcement prompted some of the papers to announce that operations at all the mines had been reduced to five days per week. It is announced officially that the Anaconda smelters have been operated at full capacity. The actual curtailment so far has been equal to about the former production of the Clark mines. It is admitted that there may be a further reduction of output if necessary, but at present it is not contemplated. The contract for the construction of the tramway from the Colorado mine of the Davis-Daly company to the Northern Pacific railroad tracks has been signed, and workmen are engaged in work preliminary to putting down the rails. M. W. Brown, general manager for the Heinze company, says that active mining ought to commence in the Colorado in about one month. It is stated that 500 tons of ore per day will be shipped to the Heinze concentrator at Basin as soon as the tramway is in condition to allow the ore being run over the line. Mining men who have been in the Colorado declare that large quantities of high-grade ore have been blocked out on the 1200, 1400 and 1500-ft. levels, the value running about 6% copper with some silver. The Ohio Copper Co. is producing at the rate of about 8,000,000 lb. of copper per year, and if F. A. Heinze is successful in arranging his refinancing scheme in Europe, the mill will be completed and fully equipped, whereas, at present only about one-half the mill is in shape to handle ore. Mining is now being carried on at 50c. per ton and concentrating costs 40c. per ton, these figures also including the cost of management and incidental expenses. The Ohio has a floating indebtedness of $600,000 with outstanding bonds amounting to $1,246,000, convertible into stock at par, while there are bonds in the treasury amounting to $754,000 and it is the sale of these Mr. Heinze is now endeavoring to effect in Europe. W. L. Credon has commenced an examination of the silver ore reserves in the Ophir mine of the Butte Central Copper Co., and upon the result of this examination will depend whether the company will erect a mill to treat the ores now on the 200, 300, 400, and 500-ft. levels. These ores are said to be rich in silver and if Mr. Credon so decides the mill will be built as it is contended that the silver will not only pay the operating expenses but will leave something for the treasury. A force of men is now at work in the Ophir and sinking to a depth of 1,000 ft. will soon be commenced. After two continuances the case of the minority stockholders against the Parrot Mining Co. for an appraisement of the stock has been set for hearing on September 12. Under the laws of Montana minority stockholders have a right to ask for an appraisement the expense to be paid by the company. The Butte Ballaklava company is sending a little over 200 tons of ore per day to the reduction works, producing 16 tons of copper besides a high value in silver. High-grade ore is still being found. The next dividend of 5% is payable August 1. The Silver King, one of the Davis-Daly mines, is being developed by means through a new shaft. This is down 125 ft and at that depth the Silver King vein has been cut. The width has not been determined but driving has been started on the foot wall where the orebody has been opened to a width of 7 ft. The drift has been extended about 100 ft and the assays run from 2% to 4% copper and about 12 oz. silver. Some assays run as high as 30 oz., the silver value being variable.

There is a possibility that the Barnes King Gold Mining Co.'s property which was closed down a short time ago, will be re-opened by lessees. It is stated that the officers of the concern are negotiating at the present time with a view to leasing the property and that everything looks favorable for the plans to be carried to a successful issue. It is more than likely that just as soon as the negotiations are satisfactorily arranged a stockholders' meeting will be held to ratify the arrangements. Robert C. Davis, superintendent for the Iron Mountain Tunnel Co., reports the discovery of a new outcrop of rich ore near the top of the mountain on the Iron Mountain claim. The outcrop is three feet wide and chunks of the ore have been assayed showing 50% lead and 30 oz. silver per ton. Mr. Davis estimates that the new vein can be reached by extending the adit at the 1600-ft. level a distance of about 500 ft. Samples of the ore have been tested by the General Engineering Co. of Salt Lake, which is drawing the plans for the alterations in the mill in accordance with the requirements indicated by the tests. The plant is to be increased to a capacity of 150 tons per day. Mr. Davis says the market product of concentrate will assay 72% lead and 60 oz. silver. Tuolumne is mining ore as usual and shipping 100 tons per day to the smelter in Anaconda. While the papers in connection with the application for an injunction by the North Butte company have been served on the Tuolumne president, nothing further has been done and no time has been set for the hearing of the case. The East Butte Copper Mining Co. has filed a petition in the district court asking permission to turn over the money to the clerk of the court now claimed by W. O. Clymo and the Anaconda Copper Mining company. The amount involved is $2494.45, the net value of ore from the Ticon mine, the ground being in dispute between the Ticon and the Anaconda companies.

WASHINGTON

Coal Mine Accidents.—Iron Ore Production.

That the work of the Technologic Branch of the Geological Survey, now the Bureau of Mines, is beginning to be felt in a reduction in the number of deaths in the coal mines, is apparent from a report by E. W. Parker, the statistician of the Survey. He gives the number of coal miners killed in the United States in 1909 as 2412, as against 2450 in 1908. The figures for 1909 are really better than they appear on their face, for Mr. Parker has added this year three States which did not furnish fatality figures for 1908. There were 33 deaths in these States, which deaths should be subtracted from the total of 1909 if the figures are to be compared with the previous year. Also this year there was a 10% increase in the production of coal for 1909 over 1908. To show that real progress has been made in the investigation of the causes of mine

disasters, the best comparison is the number of tons of coal mined for each life lost. In 1907, when 3125 men were killed in the coal mines, 145,471 tons were mined for each life lost. In 1908, with 2450 miners killed, 167,545 tons were mined for each life lost. In 1909, with 2412 men killed, 186,567 tons were mined for each life lost.

The report by John Birkinbine, on the movement of Lake Superior iron ores in 1909, has also been issued by the Geological Survey. The most striking feature is a map which shows the routes of shipment of the ores and the points to which they were shipped. The total shipment of iron ores from the Lake Superior region in 1909 amounted to 42,504,110 long tons, a quantity greater than that shipped in any preceding year. Most of this ore was shipped by water, during the seven or eight months of the year when navigation is possible on the Lakes. The principal shipping docks are at Two Harbors and Duluth, Minn., Superior and Ashland, Wis., and Marquette, Mich. Nearly 36,000,000 tons shipped from the docks passed through the Sault Ste. Marie canals and through Lakes Michigan and Huron to their places of destination, the greater part of the ore being delivered at the receiving docks at Toledo, Sandusky, Huron, Lorain, Cleveland, Fairport, Ashtabula, and Conneaut, Ohio; Erie, Pa.; also Buffalo and Tonawanda, N. Y. Most of the ore received at these ports is consumed in eastern Ohio and western Pennsylvania. In 1909 about 23,000,000 tons were sent to the Cleveland and Pittsburg region.

The Lake Superior ores represent about 80% of the total iron-ore production of the United States. The total production of iron ore in the Lake Superior region, by ranges, to the close of 1909 is shown in the following table:

	Tons.
Mesabi	195,703,424
Marquette	91,903,991
Menominee	71,313,115
Gogebic	60,820,503
Vermilion	29,125,385
	448,866,418

These figures do not include stocks of ore which have accumulated at the mines.

SALT LAKE, UTAH

Utah Consolidated. — Silver Shield Mill. — Government Rescue Station.—San Juan Oil.

The time when the intermountain region will again see real competition in the smelting industry seems to be at hand. The first of the reverberatory furnaces at the new International smelter has been lined, a second is almost ready for the lining, and a third should be ready for operation soon after the first of the month. The Utah Consolidated's contract with the Garfield plant is about completed, and as soon as the last of the contracted tonnage is delivered the ore will be turned over to the International. The statement that shipment to the new plant will be at the rate of 1000 tons per day is something of an overestimate as the company does not contemplate, for the present, at least, shipping any more to Tooele than it is shipping at present to Garfield, namely 800 tons. With Utah Consolidated operating under its new contract and sharing in the profits of the International, it should be able to return to the dividend-paying class although it would be rather optimistic to look for it to go at once on its old basis of $2 per share.

The Silver Shield, of Bingham, has completed the foundations of its new concentrating mill and the work of erecting the building and installing the machinery will be pushed as rapidly as possible. The plant will operate at 60 tons per day at first, with the expectation of increasing the capacity as the mine is able to supply it. Free & Taylor, the contractors on the new Snake Creek tunnel, have placed an order for 14,000 ft. of 16-in. galvanized steel ventilating pipe for use in the tunnel. Delivery is to be at the rate of 400 ft. per month until the contract is completed. The tunnel is in nearly 800 ft. and is progressing at the rate of about 400 ft. per month. With the arrival of the electric haulage locomotive, which is expected about the first of August, the equipment will be complete. The tunnel will begin cross-cutting some of the vein systems of the district at about 3000 ft. and from that time on should make some interesting disclosures. The hoisting plant of the Mammoth, which was badly wrecked in an overwinding accident, has been examined by an Eastern engineer and the damage found to be less than was first supposed, although it will be necessary to build a new head-frame and drum for the hoist. A small hoist is being installed at the adit-level that will permit of operations to 1000 ft. while repairs are being made which will be for about two months. The first work will be the repairing of the shaft timbers which were torn out by the broken cable and the cage dropping. Two thousand feet of cable will have to be replaced. The Primrose group, which has lain idle for a long time, has been leased and operations will be resumed in a short time. In the early days this group of claims produced about $100,000 at a shallow depth, but operations were discontinued when copper was found.

Utah will have one of the new government rescue stations which will be established at or near Salt Lake City. This station will be expected to serve the coalfields of Utah, western Colorado, and southern Wyoming. The Indian Queen, in the Beaver district, has been closed down indefinitely. The company has money in the treasury and has done a large amount of development, including a 5000-ft. adit which has attained a depth of 1200 ft., but the ore has never been found.

Engineers for the Santa Fe and the Denver & Rio Grande are in the San Juan oilfields making reports for their respective companies. The Chicago Oil Co., which is supposed to be backed by the Standard Oil interests, has three rigs on the way and is to begin operations in this field. There are five wells now in the field, which are producing oil in commercial quantities. The San Juan fields are unquestionably large and have prospects of producing a great amount of oil, but there has been a considerable amount of misstatement and exaggeration about them of late. One curious feature of a portion of this country is a natural spring of peculiar oily fluid which will not burn but which has been found to make an excellent compound for cleaning out scaly boilers. It has been tried with success by the Salt Lake railroads and a carload has just been shipped to the Seaboard Air line. It is used in its crude state without any refining. The Cardiff in Big Cottonwood, has commenced shipping, the first carload netting $50 per ton. The company has been deveolping and unwatering for about a year but now is in shape to maintain a small regular production. A reminder of old days come from a trial in Ogden in which certain stockholders of the Golden Rule mine are seeking to recover the sums which they paid for their stock, charging that the samples, on the strength of which they invested, were salted. Assays of $952 per ton in the 'promotion samples' dwindled to 5c. when the mine was sampled by a disinterested person.

BLACK HILLS, SOUTH DAKOTA

Labor Conditions.—Tin Mining.—Wasp Rebuilding Mill.

Since the resumption of work by the mines of the Black Hills, using non-union labor, conditions have gradually improved. A large part of the new labor supply was drawn from Michigan, Wisconsin, Missouri, and Kansas, with some from Colorado, Montana, and other Western States. It was necessary to break in the new men to conform with Black Hills methods, but this was an easy task, even with the men from lead and zinc-mining districts. How well the men have taken to local methods is instanced at one property, where in treating a little over one hundred tons per day, the work of mining and milling is accomplished by a force consisting of five less than was used prior to the lockout. At this property the average tonnage has run a little higher, and since resuming not a minute's time has been lost in the mill. This is not an exceptional case, but is an example of conditions at all of the properties. The

organization of the Homestake Employees Benefit Association has been nearly completed. This organization practically covers the field of a labor union in so far as sick and death benefits, recreation rooms, and grievance committee is concerned, and its membership will undoubtedly include nearly all of the employees of the Homestake. The company will assist the organization in every way, taking care of all of the clerical work at the general offices in Lead and in addition making a cash contribution each month, amounting to not less than $1,500. Under the plan as proposed each member will pay one dollar per month, entitling him to all rights in the association, as well as medical, surgical, and hospital care.

At Tinton, in western Lawrence county, the Tinton company is milling in an experimental way, and the prospect seems good for developing a big tin mine. The mill was built several years ago, was found to be inadequate and improperly equipped for the class of ore mined, and has been remodeled and repaired all out of semblance of its former appearance. It is now an up-to-date plant, and when enlarged on present lines will make good production. The mine shows a big vein of characteristic greisen, with a good tin content. E. C. Johnson is still working on the Gertie tin mine, at Hill City, having lately had constructed a grinder of his own design, at the Homestake shops, for crushing ores. This machine resembles a tube mill, but uses iron rollers in place of pebbles. Exhaustive tests were made by Mr. Johnson with a small machine, before the construction of the full-sized one. He expects to start milling within thirty days. The Pa Ha Sa company, owning the old Harney Peak Tin company holdings, has nearly completed the dewatering of the Cowboy shaft. In this shaft the Harney Peak had one of its best tin showings, and A. R. LeDoux, general manager, is anticipating good results with further developments.

The gypsum and stucco industry is growing to considerable proportions in the foothills of the Black Hills. Two big plants are operating and four more are either under construction or getting money together for active work. The plants are situated at Blackhawk, Rapid City, and Hot Springs. Securing a high-grade gypsum from immense beds which require but a few feet of stripping, these plants turn out an excellent grade of plaster at a small cost. A splendid market is found east and north of the Black Hills where newcomers are rapidly settling on homestead lands.

The Black Hills Development & Financial Corporation, operating at Carbonate, has just shipped two cars of ore to Denver. This is the first production from this camp in nearly a quarter of a century. The camp was first opened and known as a silver camp, producing over a million dollars in a couple of years. The ores just shipped showed a preponderance of gold value. The company is engaged in pumping out some old workings, preparatory to following up the old high-grade shoots in a search for milling ore. Much to the gratification of the management, expenses are practically being paid by sorting over old dumps. R. Bunce, of Deadwood, is manager. Paul Danckwardt has a force of men at work repairing the Gilt Edge-Maid mill, at Galena, preparatory to a resumption. Since suspension a year ago the property has changed hands, a Chicago corporation, headed by J. S. Ford, having secured it. Several changes are being made in the mill, one of the most important being in the crusher. It is expected that operations will be resumed about September 1. Work is progressing favorably in rebuilding the mill of the Wasp No. 2, which was destroyed by fire in January. The foundations are completed, part of the machinery delivered, and lumber is now coming rapidly. The plant will have a capacity of 300 tons, with some minor improvements over the old mill. It is being erected at the head of a dry gulch, instead of on the old site overlooking Whitewood creek. The tailing dump was getting a little too close to the C., B. & Q. tracks, and the disposition of the mill refuse would have been a serious problem in another year or so. The new site also makes available a quantity of ore which will be moved down grade to the mill. The difference between dropping ore down grade or hauling it up is a big item.

NEW YORK

Copper Curtailment — Smelting Situation — Bonus to Planet Railroad. — International Smelting & Refining Co. — Silver. — Standard Oil

It is a continual matter of surprise that the weakness of the copper situation should affect the entire market so strongly as it does. Nothing could more clearly demonstrate the interdependence of our highly developed commercial structure. Like a chain the market can be no stronger than the weakest link. The week has seen a marked turn in the sentiment as to the future of copper. It is said, and evidently credited in high financial circles, that an agreement looking toward the restriction of the world's copper output has been entered into by some of the principal factors in production. There have been rumors of conferences abroad for some days, but the statement, which is couched in positive terms, is to the effect that the Rothschilds, controlling the Rio Tinto; John D. Ryan, representing the Amalgamated Copper Co., and Daniel Guggenheim, speaking for the porphyries, have reached an understanding as to curtailment, the details of which are not, and probably will not be, made public. It is expected that the producers on this side will readily fall into line with any reasonable program which promises effective improvement. It is admitted on all sides that nothing more than a tacit 'gentleman's agreement' is possible. Any iron-clad coalition of the principal producers would undoubtedly be pounced upon by the authorities in Washington, no matter how temporary such an agreement might be. Notwithstanding this very illusory promise of relief, the substance of which must perforce remain intangible and unrecorded, its effect was immediate and pronounced both in the market for the metal and in the price levels of the leading copper issues. Copper in London was marked up £1 per ton, New York ⅛ and 1/16c. per pound. Amalgamated Copper declared its regular quarterly dividend of 50c.; although the shares moved up with the rest of the copper list on the promise of better metal market conditions, Amalgamated is bound to continue as a weak spot in copper on its income basis, especially as there is no surplus accumulating large enough to give promise of future melon cuttings. Boston & Montana declared a quarterly dividend of $4; $2 regular and $2 extra; this is an increase of $1 over the distribution of three months ago and is announced by the company to be declared out of the dividends received from the company's holdings of Anaconda. An interview, given out this week, by W. A. Clark, former Senator from Montana, is being widely quoted as evidence of an understanding on the part of the larger producers, that all of the more important interests, at least, are to help maintain prices. Mr. Clark also takes occasion to criticise the porphyry coppers on the usual ground that they have boosted the price of their shares, while mining the rich ore, without making proper charges for later increased costs or for plant depreciation. None of which is new, but it is timely, and as Mr. Clark is probably the largest private individual factor in the copper world, he has a more than ordinary right to be heard. His position is unique, in that he has chosen to act as an individual, rather than as the head of large corporate organizations. His corporations have always been mere matters of convenience in the conduct of his business. There is no other individual in the copper world who occupies a similar position. While it is undoubtedly true that such concerns as Phelps, Dodge & Co. and the Calumet & Hecla, will diplomatically deny any understanding with any other concern, it is equally beyond doubt that Mr. Ryan and Mr. Guggenheim knew for whom they could speak before they went into conference with the owners of the Rio Tinto.

One more important, if not the most important, phase of the understanding said to have been reached, and one which is of interest to all producers, is the question of supremacy in the smelting industry. It has been evident for some months that the smeltermen had settled into a grim fight. If they have decided to agree, the mining industry in

general will be eager to learn the conditions of the truce or the treaty, as the case may be. Ray Consolidated and Chino are in course of hurried preparation for outputting copper. If the ores from these properties are not to be used to hold down the competition in the smelting industry a little less haste may be expected in their development. Sherwood Aldrich, president of the Ray Consolidated, is just home from a month in France and Germany. He says that progress at the Ray Consolidated is satisfactory, that the structural steel for the mill is largely up, that the grading for the power plant and for the smelter is completed, and the steel deliveries for both will begin soon. The churn-drill on the Planet property near Parker, Arizona, has cut some rich ore. This property was purchased by the Lewisohns last fall, and since the option was taken over the exploration work has been in progress. It is expected now that a spur will be run by the Arizona & California railroad from Bouse to Planet, and the moment transportation is provided the work of erecting a new smelter will begin. Boston and Duluth interests have organized the Boston Miami Copper Co., taking over some forty claims adjoining the Live Oak just southwest of the Miami, the Inspiration, and the New Keystone in the Globe district of Arizona.

The Utah Consolidated is having a great deal of trouble with its new tramway, which carries the ore four miles from the mine to the ore-bins of the new smelter of the International Smelting & Refining Co. For a part of the distance the line runs up a steep mountain side and the tension when the line is carrying loaded buckets is tremendous. Although the net earnings of the International Smelting & Refining Co. are showing a material increase over last year's profits, it is not expected that there will be any increase in the quarterly dividend to to be declared next month. The company pays 8%. Eearnings for the first half of the current year were at the rate of 14%. A cut in the dividend on the National Lead common stock from 5 to 3% precipitated a drop of about 17 points and a decline of nearly 6 points in American Smelting & Refining. Such progress as 'Smelters' made therefore on improved outlook for copper was nullified by the drop in lead. It is somewhat exasperating for the followers of the Canadian market to note only small fractional advances in Cobalt stocks generally, and to see declines in a few of the principal issues in the face of an improved market for silver. Edward Brush, vice-president of the American Smelting & Refining Co., credits the recent rise in silver to heavy losses of some speculators in the metal, who were unexpectedly required to make deliveries on their commitments to the India Specie Bank. While on its face this might appear to be wholly a matter of market maneuvering, yet it indicates two things that are most satisfactory for silver; first, that the Specie Bank only cleaned up the spot silver market after carefully investigating crop conditions in India and finding them satisfactory; second, the management of the Specie Bank evidently expects, and possibly has certain knowledge, that the Indian Government, which has not been a buyer of silver for three years, will come into the market this fall. These conditions will give a firm tone to the silver market and will be of great importance in the silver camps of Mexico. Cobalt can produce silver at 10 to 13c. per ounce in some instances, and, assured of large profits in any event, the operators and speculators of the camp alike are evidently inclined to disregard conditions prevailing in the market for the white metal. The Hudson Bay Co. at Cobalt has decided to erect a concentrator on the property adjoining the Trethewey. A 20-stamp mill and concentrator with a capacity of about 80 tons per day will be built. Application has been made to the Government of Canada by Arthur Ferland, W. C. Chambers, Charles Richardson, and others, for a Dominion charter to construct a railway 42 miles in length through the new gold camp of Porcupine, connecting the Temiskaming & Northern Ontario railway with the Metagami river, which provides open water transportation to the Grand Trunk Pacific. Mr. Chambers is a prominent railway contractor of Toronto and one of the controlling factors in the Chambers-Ferland mine at Cobalt. Mr. Richardson is a director of the Temiskaming mine. Work on the new road will start as soon as favorable action is taken upon the application. Mining progress at Porcupine is reported to be steady and healthy. A 30-stamp mill has been ordered for the Timmins property and other mines of the camp are said to be contemplating the installation of like plants. A trial run of a small lot of unsorted ore on the Timmins, which was put through the little 2-stamp mill, is said to have shown a value between $200 and $300 per ton.

There is more interest in the Western precious-metal stocks just now than for some time past. Three of the Nevada camps have been getting into the limelight: Fairview, by reason of the entrance of the Goldfield Consolidated interests into the new Nevada Hills Consolidated Co., and the announcement that sufficient ore had been developed in the mine to warrant the erection of a 100-ton mill as a first unit of a large milling plant; Tonopah, by reason of the tremendous showing of the Belmont, which is earning more than $150.000 net per month and which promises to increase by $100,000 additional each month, July earnings are expected to be at least a quarter of a million, possibly more; and Goldfield, by reason of unexpected activity in Florence. Charles S. Herzig is now in Goldfield for the purpose of examining the Florence under an option, said to have been given to a New York brokerage house, presumably for the purpose of making a market for and distributing the stock of the company.

The discovery of gold at the Batopilas property is considered important. The largest vein is said to show some four feet in width and to assay $20 to $40 per ton. Batopilas is to have a complete new equipment and the general manager of the company is now making contracts with the machinery houses for the new plant.

The organization of the Batopilas Mining, Smelting & Refining Co., Ltd. of London, to take over the lease of certain groups of mines of the Batopilos Mining Co. of Mexico, has been successfully completed. Fifty thousand shares of the English company have been underwritten and listed on the Paris Bourse, 75% of the total stock being owned by the Batopilas Mining Co. It is proposed to make similar arrangements for working other mines of the Batopilas company and also starting new mines at favorable points throughout the company's concession from the Mexican Government, which covers an area of 61 sq. mi. It is believed that the more extensive operations should assure an increased revenue to the company from its properties, some of which have yielded silver since their discovery by the Spaniards in 1633. The first unit of the Palmilla Mining Co.'s new mill at Parral, is nearing completion. The power house is nearly finished and the steel work for the mill will be completed the early part of August. It now appears as if the plant would be in operation by October.

Samuel Untermeyer has a $20,000,000 oil company for London capital. The properties are in the vicinity of Bartlesville, Oklahoma, and the building of a pipe-line to tidewater on the Gulf is contemplated. There are some big competitors springing up around the Standard Oil Co. John W. Gates' new concern, the Texas company; the Mexican Eagle, backed by the Pearsons of London and now engaged in a life and death struggle with the Waters-Pierce branch of the Standard Oil Co. for the oil trade of Mexico; the Associated Oil Co. of California, recently listed on the New York Stock Exchange; and Mr. Untermeyer's recent creation are among the principal ones, and these seem apt to grow to a point where they cannot be stifled, as was formerly the usual fate of would-be rivals of the Standard. What with competitors reaching after trade and an extended line of battle engaged in repelling the attacks of the law departments of a large number of the States of the Union, as well as that of the Federal Government, seeking to annul the company's charter, the Standard Oil Co. may be forgiven some nervousness. A gain of $13 per share in the stock on the curb one day and the loss of $6 per share the next seems to point to a situation that is beginning to get on somebody's nerves.

General Mining News

ALASKA

(Special Correspondence.) The Ellamar Mining Co. whose mine is at Ellamar, Prince William sound, has completed a coffer dam by which 250 ft. of its vein outcrop, formerly under water, has been exposed. The dam forms a horseshoe curve and is about 600 ft. in length. It was constructed of 4 by 12 in. timbers driven to make two parallel walls, leaving a 15 ft. space between them that was filled with glacial clay. This made an effective seawall 20 ft. higher than the surface of the water at low tide. Drain pipes serve to carry the water from the enclosed area, and to supplement this arrangement a steam pumping plant has been installed. The exposed outside timbers, encasing the wall, are creosoted. The shaft, now at a depth of 600 ft., was sunk some distance from the waterfront on higher ground. The vein is in a slate formation and is 80 to 300 ft. wide. The workings, which are extensive on a number of levels, lead out under the sea. It is proposed to carry the stopes to the surface in that part of the vein the cropping of which has been relieved of water by the coffer dam. The ore is said to assay 32% iron and 10 to 13.5% copper. In fact, the last shipment, which was in March, assayed 13% copper, and $2 gold. It is believed the general average of ore that is to be shipped this summer and fall will be 10% copper. F. M. Jordan, general manager for the company, states that shipping is to begin in August to the Tacoma smelter. L. L. Middlekamp is in direct charge of the operations.——The Alaska Northern Railroad Co. has 71 miles of road in operation from Seward to Kern creek, and the work of extending the line from the present terminus to the Matanuska coalfields, near the Susitna river, a distance of 170 miles, is in progress. There has been some travel from its Kern creek station to Iditarod, 400 miles distant, this season.

Ellamar, July 22.

ARIZONA

COCHISE COUNTY

At a recent meeting of the board of directors of the Gold Queen Mining Co., at Courtland, B. S. Taylor was elected president, and D. S. Drew vice-president. The board decided to erect a 15-stamp mill and contracts for the machinery will be let at an early date.——The shaft of the Bismark Gold Mining & Milling Co. at Cochise, is down 62 ft. on a lead-silver-gold ore that is valued between $4.50 and $23.50 per ton.——The adit at the Virtue property in the Paradise district is in 744 ft. and it is estimated that it will take about 350 ft. additional to crosscut the ore.——In the Dragoon district, the Higgins claims are being surveyed for patent.——The connection between the winze sunk on the 1400-ft. level of the Lowell and the 1600-ft. level of the Sacramento shaft of the Copper Queen is expected to break through in a few days. The 7-ton motor that was installed recently on the 400-ft. level of the Holbrook, is running steadily and giving complete satisfaction.

MOHAVE COUNTY

Prisk & Perdue who have a lease on the Home Pastime mine in the Mineral Park district, shipped a car of ore recently to the Needles smelter that assayed $50 to $200 per ton. This makes the sixth car that present lessees have shipped.——The raises from the adit level of the C. O. D. mine have been completed and the ore is now ready for stoping, while the grading for the new 100-ton mill is well under way.——Four feet of zinc ore has been opened on the back vein at the 100-ft. level of the Golconda mine, by the cross-cut into the foot-wall. There are four levels now opened for stoping and it is expected that the production rate in the future will be 1000 tons per month.——The Ruth-Rattan Mining & Milling Co. has been formed to take over the Ruth and Rattan claims of the Rattan Mining Co., in the San Francisco district west of Silver creek. There is a 200-ft. shaft on the Ruth which [illegible]ed a 3-ft. vein of $20 ore. The company will move the old 10-stamp mill from its present site on the Colorado river to the mine and will install a complete cyanide plant. Ell Hills will be superintendent.

NAVAPAI COUNTY

The cross-cut from the foot wall drift on the 800-ft. level of the Little Daisy mine at Jerome, has opened over 30 ft. of copper ore.——C. N. Smith, of Milwaukee, has purchased the Bulger group on Cherry creek and will commence work about September 1.——New machinery has been shipped to the Arkansas & Arizona Mining Co., and the orebody cut by drill hole No. 2 will be opened.

YUMA COUNTY

C. H. Schen, of Los Angeles, has secured an option on the Desert Butte silver lead mine near the station of Kilbeck, on the Parker cut-off, and will commence development September 1.

CALIFORNIA

BUTTE COUNTY

Through the efforts of the Anti Debris Association, the gold dredges which have been operating on Honcut creek, have been enjoined by K. S. Mahon, Judge of the Superior Court of Sutter county. The injunction stated that the dredges of the defendants dumped the debris into Honcut creek, and that it in turn found its way into the Feather river, damaging the channel in Sutter county and greatly endangering the adjoining property from floods.

NEVADA COUNTY

The Lilly Consolidated Gold Mining Co. has been incorporated to prospect the vein found on the Mitchell ranch between Nevada City and Grass Valley.

SHASTA COUNTY

Two of the furnaces at the Mammoth smelter have been closed down temporarily as the temperature of the smoke passing through the bags at the present rate is too high. As a result 100 men have been dropped from the payroll and the Quartzville mine at Old Diggings closed down. This property furnished the flux for the Mammoth ore and is held under lease by the company which has an agreement to mine 15,000 tons annually from the property. As this amount has been taken out this year the suspension will not affect the lease. David P. Doak, who owns 5080 acres of timber land extending from Kennett to Winthrop, has filed suit against the Mammoth company for $76,000, alleging that the smelter smoke has damaged the timber to that extent.

SIERRA COUNTY

(Special Correspondence).—Sierra City is at this time having quite a revival in a mining way. The old Columbo Mining Co. is under bond to C. W. Thompson and associates, of Oakland, California. The old No. 1 adit is being cleaned out and a thorough sampling will determine whether the mine will be opened on an extensive scale. Several good sized stringers of high grade ore have already been found.——The old Chippes now operated by the Swastika Mining Co., is erecting a 10-stamp mill and the work in the mine has been temporarily discontinued until the plant is completed. L. H. Holley is superintendent.——The Phoenix has been re-incorporated by all the claimants to the property. The operators installed an 8 drill air-compressor to operate four machine drills. Also the mill is being repaired and a new Pelton wheel is installed to drive the compressor. The old adit on the property is being retimbered, and mill and mine should be working at full capacity by September 1. This mine has been closed for nearly 15 years.——J. E. Coghlan, who has a lease on the Keystone property, has just completed his second mill-run and is getting ore from the old workings for the next.——The Cleveland Gold Mining Co. is starting a mill run from the lower adit where it has a vein of low-grade ore 30 ft. wide.——The Sovereign mine in Ladies canyon, is driving a 1600-ft. adit to tap the vein exposed in the upper workings.——The county supervisors at their last meeting ordered the road to be surveyed from Sierra City to Gold

lake, to connect there with the Plumas county road from Clio, on the Western Pacific. The road will go by Salmon lake, Sardine lake, and near the string of 40 lakes on the ridge, and will be 20 miles long, greatly facilitating freight and passenger service.

Sierra City, July 25.

SISKIYOU COUNTY

P. W. Fisher, who is developing a group of claims on the north fork of Humbug creek, opened a seam of ore that assayed over $1000 per ton.——The owners of the Gray Eagle claims on Indian creek, are doing the assessment work for the year.

TRINITY COUNTY

(Special Correspondence).—The Enterprise Mining Co., in the East Fork district near Helena, is confining its work to development only. The property consists of several claims and a water-right, and is equipped with a 10-stamp mill, saw mill, and electric light plant. The mine is owned by Boston capitalists, and is under the management of George Fenwick. Considerable ore has been blocked out

Map of Portion of Trinity, Shasta, and Humboldt Counties, California.
(After MacDonald, U. S. Geol. Survey.)

and the mine is in condition to commence stoping at any time.——The East Fork Developing & Mining Co. has an excellent prospect and is developing it by an adit and incline shaft on the vein. W. S. G. Todd is manager.——On the same branch of the east fork is the Golden Chest group, owned by T. J. Rochford and associates. There is more development on this property than on any other in that district and a good grade of free-milling ore with considerable telluride, has been opened. The Bonanza group of J. L. Johnson and the Trinity group of William McClaren are in the same district. All of these properties contain small high-grade stringers, it being an easy matter to pick up specimens showing free gold on any of the dumps.

Carville, July 25.

TUOLUMNE COUNTY

(Special Corerspondence).—The Tuolumne Consolidated of California will shortly receive a dredge and other machinery for its gravel property near Phoenix lake, and it is probable that in the near future another dredge will be purchased. The company is employing about 80 men, and is rushing work on its dam, ditches, and buildings. Development is also in progress, the prospects showing that the gravel is rich and uniform in value.——A compressor, larger than the one now in use, is to be installed at the Mangante mine, and the working force considerably increased.——The mill at the property of the Springfield Tunnel & Development Co., is in operation and results are said to be satisfactory.——The Black Oak mine is being unwatered to the bottom level, preparatory to sinking.——The Jubilee mine, formerly known as the Hazel Dell, is being actively worked, and more machinery is to be installed in the near future.——The Elizabeth mine, situated near the Hazel Dell, has been bonded to Bernard & Anderson, and work will be commenced at once.——The drift being driven from the bottom of the shaft at the Gold Ship Mining Co.'s property, near Groveland, has reached gold-bearing gravel and it is expected that bedrock will be exposed before long. It is the intention of William Graham, the manager, to install a mill to crush the gravel, and arrangements are being made for electric power.

Tuolumne, July 25.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence).—The Capital Mining & Tunnel Co. has started to drive an adit on the West Aetna vein. It is proposed to drive 700 ft. to intersect the main raise on the Aetna vein to obtain a circulation of air.——A sale is pending for the transfer of the Strumberg group of claims on Covode mountain. The consideration is given at $50,000.——D. H. Burlingame has secured a lease upon the Santiago mine and mill. On an average of 30 tons per day of smelting ore is being shipped.——Shipments of ore have been started from the Oneida mine on Trail creek. The return on the first carload was 1.95 oz. gold and 1.03 oz. silver per ton. John Owen is manager.——A shipment of a carload of ore from the Princess Alice mine that was made last week brought a settlement of 1.28 oz. gold and 3 oz. silver per ton. J. F. Kaminky is manager.

Idaho Springs, July 23.

GARFIELD COUNTY

At the Grey Eagle claim at Goldstone, 11 miles north of New Castle, the vein is 2 or 3 ft. wide, and averages $35 in gold, with a few ounces silver per ton. The vein is in a fissure in granite, the ore being a sulphide of iron. The vein has been opened on several levels and it is the intention of the company to erect a mill in the near future. F. J. Bodfish is manager.

GILPIN COUNTY

(Special Correspondence).—The Sternberger power plant on Fall river has been completed and electric power was turned on last week. Electricity is to be sold in the Fall River, Russell, and York districts. The plant cost $200,000.—The new shaft house on the British mine has been completed, and machine drills have been brought into use.——The mill building for the Golden Sun Mining & Milling Co. has been completed and the machinery is now being placed in position. The plant is to have a capacity of 40 tons per day.——Jones & Oliver, leasing on the Mitchell mine, have sold a one-third interest to Thomas & Keppler. The new pool will at once erect a shaft-house and install machinery.——Work has been resumed on the East Flack mine by Christopher & Co. The shaft, down 150 ft., will be sunk another 100 ft. If the showing warrants machinery will be purchased.——New macninery has been sold by Stroehle & Son to the operators of the General Jackson property situated in Elkhorn gulch.

Central City, July 22.

LAKE COUNTY

Good progress is being made in driving the Birdella adit by the Gleason Gulch Mining Co., the breast now being in nearly 700 ft.——The Famous shaft in Big Evans gulch will be down 700 ft. in a few days. A station will be cut, pumps installed, and lateral work started to develop the ore-shoot.——The shaft which is being sunk on the Free America and Little Galesburg claims on the north side of Breece hill, has cut a heavy flow of water and pumps will be installed before sinking can be continued.——The lessees on the Montgomery are shipping about 75 tons of ore per day and prospecting the orebody that was opened in the Yankee Doodle ground. The drifts from the Lime shaft have been cleaned out and a wagon-road completed to the mine. When the work starts underground the lessees expect to ship 25 tons of ore per day.——Beamer & Co., who

have a lease on the Adelaide are still working in the upper levels of the mine but are preparing to clean out the old shaft and commence exploration of the orebodies in the lower portion of the ground which has been drained by the Yak tunnel.—The old Mab dump is being screened by lessees and material shipped that assays 40 to 50% lead.——The upper levels of the Greenback are being prospected and if found to contain ore of commercial value the lower portion of the mine will be unwatered.

SAN JUAN COUNTY

The cross-cut on the third level of the Lutz Abbott Bonner group in the Silverton district has opened the vein exposing a 16-in. stringer of sulphide ore. There are 15 men working in the mine from which a carload of ore was shipped to the Kuenzel smelter a short time ago. A. S. Sturgeon is manager.

DELTA COUNTY

A washer and gasoline engine has been moved to the dump of the Mary McKinney property, and the rock will be treated by lessees.— On the Dillon property the Carol Mining Co. is cross-cutting toward the Granite shaft to open an orebody that had been found before the closing of the main shaft.——The water in the Eclipse shaft has been lowered 375 ft. and it is expected that the mine will be completely cleared to the lowest level, 500 ft., in a few days.——The Jerry Johnson shipped a $4167 gold bar to the mint last week as the result of the clean up of the Gaylord mill.——Work has been resumed at the Lower Dead Pine by the sub-lessees Keagle & Company.

NEVADA

ESMERALDA COUNTY

Charles S. Herzig, representing Eastern capitalists, has purchased the control of the Jumbo Extension Mining Co. which owns considerable property at Goldfield and Diamondfield. The Goldfield group consists of the Gold Wedge, Polverde, Vinegorone, and Dick Bland fractional claims, and the Diamondfield group includes the Gold Coin, Saddle Rock, Three Friends, Three Friends Fraction, Black Butte

Florence Mine and Mill.

No. 1, and Black Butte Fraction. The property has been worked almost exclusively by lessees, the company having derived a revenue of approximately $50,000 in royalties. It is understood that Mr. Herzig is also negotiating with Parker and Lockhart for the control of the Florence.—— About four miles west of Goldfield and a little south of the Ben Hur group James Carson has found a 7-ft. vein which contains several inches of high-grade ore.——The Goldfield Consolidated Mines Co. has ordered a 24-in. water-jacketed furnace, a cupeling furnace, and blower from the Allis-Chalmers Co. with which to refine the bullion and precipitate at the company's mill.——The settlement from the Hazen sampler for the ore shipped recently from the Grutt-Balloon Hill lease amounted to $111 per ton. The ore was stoped on the 350-ft. level.

LINCOLN COUNTY

The force at the Mendha mine in the Pioche district, has been increased to 30 men, and the teams are hauling 20 tons of ore per day to the railroad——The Pioche Metals Mining Co. shipped a carload of silver-lead ore to Salt Lake a short time ago that was obtained while sinking the shaft to the 300-ft. level. Drifts have been started in both directions along the contact at that point.—The management of the Consolidated Pioche Mining Co. has decided to sink the No. 1 shaft to the 1200-ft. level by contract and is receiving bids for the work.—The Highland Mary which is under the direction of S. H. Babbitt shipped two carloads of silver-lead ore to the Salt Lake smelter recently.—It is reported that the Pioche King which is situated between the Pioche Golden Prince and the Prince Consolidated is to resume shortly.

LYON COUNTY

The Keystone mine in the Mount Grant district which was sold last April to a Boston company, has been closed down as the result of the development by the company has not held up to the original report on the ground. The company built a modern assay office and commenced the erection of a 40-stamp mill, part of the supplies for the plant being now on the road.—The Black Rock group, six miles east of Yerington, has been sold to Racine capitalists, and will be operated by the Black Diamond Copper Mining Co. There are four veins on the group which can be traced a distance of 2600 ft. on the surface. Two shafts have been sunk on the ore to a depth of 80 and 150 ft. respectively, opening a copper ore with some gold and silver.— L. H. Bartholomew, who is operating a 2-stamp mill on his property in the Mount Grant district, shipped a small gold bar from the recent clean up. The ore was taken from a winze which is down 30 ft., and if the shoot continues of similar value Mr. Bartholomew will add more stamps and a cyanide plant.

NYE COUNTY

(Special Correspondence).—The Belmont shaft at Tonopah is being widened to the surface and a new plant will soon be installed.——An important body of ore, 20 to 30 ft. wide, has been struck at the 800-ft. point in the MacNamara. The vein appears to be an entirely new orebody and extends the proved area of the Tonopah district considerably to the west. Sufficient development has not progressed to demonstrate the size or value of the vein, but good milling ore was opened. A raise is being driven to prospect it farther. Arrangements have been made to change the steam hoist into a 100-hp. electric hoist, in order to handle the ore opened on the new level.— The Mizpah Extension shaft has passed the 860-ft. point and is progressing at the rate of two feet per day. It will be sunk to the 1000-ft. level.——Operations on the 1035-ft. level of Tonopah Midway have been stopped owing to the presence of large quantities of gas. Powerful ventilating apparatus will be installed as soon as possible.— It is rumored that the West End company is considering the installation of a mill. A Crane ore-washer and picker is now in operation.——The Montgomery Shoshone mill is treating about 5200 tons of ore per month and diamond drilling is under way from the winze on the 700-ft. level.

Tonopah, July 22.

STOREY COUNTY

The ore taken from the stopes on the 2000-ft. level in the southwestern portion of the Ohpir mine at Virginia City, has improved considerably the last few weeks, an average of over $64 per ton being obtained for 40 cars. On the 2300-ft. level in the south drift from No. 1 west cross-cut the ore assays $9 per ton in the face.——The pumps in the C. & C. shaft are doing good work, the water now being 250 ft. below the 2350-ft. level. Excellent progress is being made in removing the debris below the 2500-ft. level and the shaft timbers are found to be in good condition.——Consolidated Virginia is stoping over 200 tons per week which is being shipped to the Sutro mill.——Work was suspended for a few days last week at the Overman and Seg Belcher mines owing to trouble with the electric cable in the shaft.—Joseph Dietrich, who is operating a lease on the croppings of the Chollar property, paid the company $1791 royalty for ore extracted during the month of June.

WHITE PINE COUNTY

A crew of graders and carpenters are at work at the Amalgamated Mining Co.'s property near Blackhorse where the company is erecting a mill to treat the ore from the San Pedro mine, and a number of other properties in that district. James H. Marriott is manager for the company. ——Work has been temporarily suspended at the Boston Ely as the shaft, which is 1227 ft. deep, has failed to open a body of commercial ore though it has passed through several hundred feet of leached material. The property is to be examined by an engineer and a new method of development outlined.——The Cone brothers, who have a contract to drive a 300-ft. adit on the Ely Silver Lead Co.'s ground, are making good progress, having completed 150 ft. of the work.——Another carload shipment of ore valued between $40 and $45 per ton was forwarded last week from the Ely Consolidated to the Salt Lake smelter. There was about 50 tons in the lot which was taken from the No. 2 drift from the Brilliant shaft, the vein averaging two and one-half feet in width.——Work at the Giroux has been considerably increased and it is reported that the ore will later be shipped to the International Smelting & Refining plant at Tooele.

UTAH

BEAVER COUNTY

The Utah United Copper Co. has opened 18 in. of rich copper ore on the 200-ft. level of its property in the Beaver Lake district, 12 miles west of Milford. The company is to sink the shaft to the 400-ft. level and cross-cut as it is expected that the sulphide zone will be found at that depth. ——A body of copper ore has been found in the Red Warrior in the Star district. This comes as somewhat of a surprise to the operators as the company has been stoping silver-lead carbonate ore previous to this.——At the Rob Roy property the control of which is held by P. T. Farnsworth of Salt Lake, a modern assay office is to be erected and later a small mill will be installed. The company has secured a water-right that will supply power for the plant and water for the batteries.——The shaft at the Oak Leaf mine, ten miles west of Beaver, is down 500 ft. on a vein of carbonate of lead and silver which varies between four and eight feet in width.

JUAB COUNTY

The timbers in the shaft of the Mammoth property in the Tintic district, which were torn out when the engine ran away some time ago, are being replaced rapidly and the work will be completed the early part of August.—— At the Tintic Combination little work is being done except that necessary to keep the mine dry. An assessment has been levied on the stock and operations will be resumed as soon as sufficient money has been paid into the treasury.——The Bullock property at Silver City which has been closed the past two weeks on account of an accident to the engine has been started again. Work will be continued for the present in the north drift on the 210-ft. level but later an assessment will be levied for the purpose of raising money to purchase new machinery and continue sinking. Elmer Duncan is superintendent.——The Primrose group which is one of the oldest in the Tintic district, will probably be under active development in the near future as Salt Lake interests are to acquire a long lease on the property. The mine produced approximately $100,000 worth of lead-silver-gold ore in early day but was closed when the copper sulphide was reached.

SALT LAKE COUNTY

After a long period spent in development the Yosemite mines Co. of Bingham has unwatered the lower levels of the property and is in a position to commence active mining. The drift from the Mascotte tunnel was driven 1500 ft. to a point directly under the Yosemite No. 1 shaft which was tapped to drain the mine. When the company abandoned the 800-ft. level on account of the heavy inflow of water there was exposed a body of copper-iron sulphide ore on which the company now proposes to commence stoping. Previously the operators were only mining the lead ore and the old stopes are too badly caved at present to determine the amount available.——The Bingham-Butte Mining Co. which has been driving the Tiewaukee adit has been reorganized and will continue work as the Montana-Bingham Consolidated Mining Co. The new company will be incorporated for 1,500,000 shares which will be exchanged for the old stock and sold to raise capital for further development. The adit will be 2700 ft. long when completed. ——The old Passed Treasure group in the Big Cottonwood canyon is being prospected, and the old shaft which is down about 75 ft., cleaned out. The 15-ft. vein has been stripped so that 20 carloads of ore is exposed that assays in the neighborhood of $25 per ton. This will be broken for shipment at an early date.——W. L. Harwood has placed a force of men at work on the property of the Big Cottonwood Consolidated Mining Co., and a long cross-cut will be driven into the hill.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—The operations of the diamond-drill on the southern part of the Knob Hill property of the Granby Consolidated, have met with gratifying results. A continuation of the Knob Hill vein has been passed through for 100 ft. by the drill, and development is now being done toward the opening of this orebody. The Granby company has commenced diamond-drilling from its 400-ft. level which should prove the value of the ore from that to the 1000. Owing to the comparatively low price of copper the company is making no great effort to produce that metal to full capacity. At present six furnaces, of the eight, are operating at the smelter, treating something over 20,000 tons per week, of company ore, and 300 tons of custom ore.——The Hedley Gold Mining Co., shares of which were recently listed on the Boston Stock Exchange, is making regular shipments of rich concentrate to the Consolidated smelter at Trail. At the 40-stamp mill at Hedley a major part of the gold content of the ore is saved by amalgamation, the concentrate from the Frue vanners assaying about $80 per ton. The company has paid $107,520 in dividends since last August. This concern also owns the Copper Flat mine, Silver City, Mexico.——Work has been interrupted at the Rambler-Cariboo, the Lucky Jim zinc property, and other mines at Whitewater, Three Forks, and in the vicinity of Sandon and Kaslo, by devastating forest fires. At this writing, however, the fires are partly under control and other mines that have been threatened may escape damage. W. E. Zwicky, manager of the Rambler-Cariboo, is now in Spokane, arranging for the rebuilding of burned buildings and tramways, with a view to immediate resumption of work. The Consolidated Mining & Smelting Co. sustained $50,000 damage at the St. Eugene mine, Moyie, from fires. The flume was burnt away at places and large quantities of mine timber destroyed. The concentrator and upper tram are reported out of danger at this date.——In accordance with the amendment to the Coal Mines Region Act, passed in March last, three rescue stations are being established by the Provincial Government, one in the Crows Nest region and two on Vancouver island. Orders have been placed with the Draeger company, Pittsburg, for the necessary oxygen apparatus.——A new Portland Canal mining concern has been launched in London, named the British Columbia Gold Field Co. of Canada, Ltd. though the investing public is confused by the contradictory reports on the Portland Canal district. The director of the Geological Survey of Canada, W. R. Brock, says that while this is not yet a proved district he thinks it is the most promising opened in British Columbia since the boom of a decade ago in southeastern British Columbia. A large territory is available for prospecting both north and south of Stewart along the inland border of the Coast range granite.——The North Washington company has closed a 10-year lease for the Similkameen power plant near Oroville.——The Buffalo group of three claims near Poplar has been bonded to Vancouver interests and work will be started at once.——Work has been resumed at the Society Girl mine near Moyie after a shut-down of a few weeks. The property adjoins the St. Eugene.

Rossland, July 23.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. H. Weed is at Chicago.

C. W. Hayes is in Mexico.

R. B. Lamb was in San Francisco.

C. S. Herzig is at Rawhide, Nevada.

Henry J. Stehli is in San Francisco.

J. R. Phillips has gone to Los Angeles.

D. W. Brunton, of Denver, is in New York.

Frank L. Booth is at San Francisco from Chihuahua.

R. A. F. Penrose, Jr., is at San Francisco for a few days.

E. W. Parker, of the Geological Survey, was in New York.

S. B. Christy and E. A. Hersam are visiting Nevada mining districts.

W. Murdoch Willy has been in San Francisco and Los Angeles this week.

Roy E. Cohn is at Berkeley on vacation from Minas del Tajo, Rosario, Mexico.

William Scallon has removed from Butte to New York and is at 55 Liberty street.

W. A. Prichard has returned to Santa Cruz de Alaya, Mexico, from San Francisco.

Wilbur H. Grant, of Spurr & Cox, was in San Francisco en route from Tacoma to Tonopah.

W. Randolph Van Liew has been appointed general manager for the Caucasus Copper Co., Limited.

Edwin Letts Oliver has established offices for the Oliver Continuous Filter Co. at 9 First street, San Francisco.

Frank W. Royer, consulting mining engineer, has established an office at 522 Mutual Life building, Mexico, D. F.

Frank H. Probert, of Los Angeles, returned to Globe, Arizona, from New York, and went from there to Chicago.

C. Colcock Jones has returned to Los Angeles from a professional trip of several weeks in Esmeralda county, Nevada.

R. B. Wheelock has resigned as engineer for the Quartette Mining Co. at Searchlight, Nevada, and will open an office at Battle Creek, Michigan.

J. D. Irving, editor of *Economic Geology*, is attending the International Congress of Geologists in Sweden. W. S. Bayley, of Urbana, Illinois, is editing the journal in his absence.

A. V. Judson has resigned his position as superintendent for the Mt. Pleasant Con. G. M. Co., at Grizzly Flats, California. His temporary address will be 2103 San Jose avenue, Alameda, California.

W. B. Cogswell, of the Solvay Process Co., is returning from a motor trip on the Continent and an outing on the Mediterranean; sailing a few days since for New York City from Genoa, Italy.

S. E. Bretherton returned to San Francisco from Shasta county, where he was starting work in the mines of the Afterthough Copper Co., and has gone to Plumas county to examine drift and quartz mines.

Carl F. Dietz, of the firm of Dietz & Keedy, of Boston, sailed for Europe on professional business during the week and also will attend the joint meeting of the Mechanical Engineers at Birmingham and London, thereafter going to Paris and Berlin on business for his firm.

The San Francisco Section of the Mining & Metallurgical Society of America held a field meeting at Grass Valley and Nevada City, July 22 to 24, the visiting members and guests being entertained by George W. Starr and A. D. Foote. Among those present were S. B. Christy, A. D. Foote, Corey C. Brayton, Whitman Symmes, William Hague, F. L. Sizer, C. C. Broadwater, George W. Starr, E. A. Hersam, C. C. Derby, Arthur Foote, Albert Burch, J. F. Farrell, and H. F. Bain.

Market Reports

LOCAL METAL PRICES

San Francisco, July 28

Antimony	12—13½c	Quicksilver (flask)	66½—67
Electrolytic Copper	14½—15½c	Spelter	7—7½c
Pig Lead	4.70—5.00c	Tin	39½—39½c

METAL PRICES

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz
July 21	12.19	4.43	5.00	54⅝
" 22	12.25	4.43	5.00	54⅞
" 25	12.25	4.43	5.00	54⅛
" 24	Sunday.	No market.		
" 25	12.37	4.43	5.03	54⅛
" 26	12.37	4.43	5.03	53⅞
" 27	12.25	4.43	5.03	53⅝

ANGLO-AMERICAN SHARES

Cabled from London

	July 21. £ s. d.	July 28. £ s. d.
Camp Bird	1 7 3	1 7 0
El Oro	1 5 6	1 5 3
Esperanza	2 12 6	1 13 9
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 0	0 6 3
Mexico Mines	8 18 9	8 15 0
Tomboy	0 16 0	0 16 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, July 28.		Closing prices, July 28
Adventure	6¼	Mohawk	44
Allouez	35	North Butte	33¾
Atlantic	6	Old Dominion	33
Calumet & Arizona	58	Osceola	117
Calumet & Hecla	515	Parrot	12
Centennial	15	Santa Fe	1⅜
Copper Range	61⅜	Shannon	9⅛
Daly West	8¼	Superior & Pittsburg	10⅝
Franklin	10	Tamarack	50
Granby	31⅜	Trinity	47⅛
Greene-Cananea, ctf.	6¼	Utah Con	21
Isle-Royale	16	Victoria	2⅛
La Salle	9⅛	Winona	5¾
Mass Copper	8⅛	Wolverine	106

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, July 28.		Closing prices, July 28.
Amalgamated Copper	62	Miami Copper	18¼
A. S. & R. Co	66¾	Mines Co. of America	⅝
Boston Copper	18⅜	Montgomery-Shoshone	⅝
B. C. Copper Co	4⅝	Nevada Con	19
Butte Coalition	17⅜	Nevada Utah	⅛
Chino	11⅝	Nipissing	10¼
Davis Daly	1⅝	Ohio Copper	1⅝
Dolores	6	Ray Central	2¼
El Rayo	32⅝	Ray Con	17¼
Ely Central	¾	South Utah	1¼
First National	3⅛	Superior & Pittsburg	10⅝
Giroux	6⅛	Tenn. Copper	22¼
Guanajuato Con	1	Trinity	5
Inspiration	6¾	Tuolumne Copper	2⅝
Kerr Lake	7⅛	United Copper	4⅝
La Rose	3⅜	Utah Copper	43⅛
Mason Valley	6⅞	Yukon Gold	3⅞

SOUTHERN NEVADA STOCKS.

San Francisco, July 28.

Atlanta	$ 13	Mayflower	$ 3
Belmont	3.80	Midway	24
Booth	13	Montana Tonopah	96
Columbia Mtn	6	Nevada Hills	2.37
Combination Fraction	50	Pittsburg Silver Peak	56
Daisy	5	Rawhide Coalition	17
Fairview Eagle	40	Rawhide Queen	25
Florence	2.50	Round Mountain	46
Goldfield Con	8.60	Sandstorm	4
Gold Kewenas	5	Silver Pick	7
Great Bend	3	St. Ives	12
Jim Butler	23	Tonopah Extension	76
Jumbo Extension	51	Tonopah of Nevada	8.50
MacNamara	32	West End	58

(By courtesy of San Francisco Stock Exchange.)

Recent Publications

SURFACE WATER SUPPLY OF THE UNITED STATES, 1907-8. Part III. Ohio River Basin. By A. H. Horton, M. R. Hall, and R. H. Bolster. U. S. Geol. Surv., Water-Supply Paper 243. Pp. 224, ill., index. Washington, 1910.

PROGRESS OF THE MINERAL INDUSTRY OF TASMANIA. By W. H. Wallace. Pp. 11. Hobart, 1910. The usual report for the quarter ending March 31, and showing a total production valued at £344,766.

MINERAL RESOURCES OF THE NABESNA-WHITE RIVER DISTRICT, ALASKA. By F. H. Moffitt and Adolph Knopf, with a section on the Quaternary by S. R. Capps. U. S. Geol. Surv., Bull. 417. Pp. 64, ill., index, maps. Washington, 1910.

An instructive little hand-book descriptive of the region southeast of the headwaters of Copper river.

MARYLAND GEOLOGICAL SURVEY, Vol. VIII. W. B. Clark, State Geologist. Pp. 486, ill., maps, index. Baltimore, 1909. This elaborate report includes three parts: (1) Second Report on State Highway Construction, by W. W. Crosby; (2) Maryland Mineral Industries, 1896-1907, by W. B. Clark and E. B. Matthews; (3) Report on the Limestones of Maryland, by E. B. Matthews and J. S. Grasty. The volume is another welcome addition to the series being published by Mr. Clark and his associates.

CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1909. Advance chapters from the annual bulletin of the U. S. Geological Survey are now available as follows: Copper, by L. C. Graton, H. S. Gale, and G. W. Stose, Bull. 430-B; Lead and Zinc, by L. J. Pepperberg, Bull. 430-C; Iron and Manganese, by E. C. Harder, J. L. Rich, A. C. Spencer, and Sidney Paige, Bull. 430-E; Mineral Paints, by J. C. Stoddard, A. C. Callen, F. T. Agthe, and J. L. Dynan, Bull. 430-G; Salines, by C. L. Breger and A. R. Schultz, Bull. 430-I.

TRANSVAAL CHAMBER OF MINES TWENTIETH ANNUAL REPORT, FOR THE YEAR 1909. Pp. 511. With a supplement separately bound containing a list of companies, syndicates, etc., registered in the Transvaal, pp. 86. Johannesburg, 1910. The work of the Transvaal Chamber of Mines is well known and the annual report of that organization has come to be regarded as one of the indispensable volumes of the year. The last report is no less valuable than its predecessors and is a compendium of all the business features of mining on the Rand. Labor, titles, laws, taxes, patents, output, and similar matters are discussed with a wealth of detail quite unequaled elsewhere.

THE GOLD HILL MINING DISTRICT. By F. B. Laney. North Carolina Geol. & Econ. Surv., Bull. 21. Pp. 137, ill. Raleigh, 1910.

The Gold Hill mines were discovered in 1799 and have been frequently described, though not with the wealth of detail afforded by Mr. Laney's monograph. By using a metallographic microscope he has worked out successfully the relation of the sulphides to each other and the relation of the gold to the sulphides. The ores are found to consist of auriferous pyrite and chalcopyrite, with which is more or less gold-bearing quartz. The gold increases as the copper decreases, so that it is thought to be associated rather with the pyrite than chalcopyrite. The report is an example of the excellent work now being done by some of the State surveys.

SOLUTION OF GOLD IN SURFACE ALTERATION OF OREBODIES. By Albert D. Brokaw. Re-print from *Journal of Geology*, May, June, 1910. Pp. 321-326. In this paper are given the results of an important series of tests carried out at the suggestion of W. H. Emmons and leading to the following conclusions: (1) that at the dilution of natural solutions of ferric salts, their solvent effect on gold is probably slight; (2) that in the presence of manganese dioxide no increased solubility is found unless chlorides are present; (3) that mixtures of ferric sulphate, sulphuric acid, and sodium chloride in concentrations common in mine waters will readily dissolve gold in the presence of manganese dioxide; (4) that free hydrochloric acid in the presence of manganese dioxide has a much greater solvent effect than the same amount of chloride in ferric chloride solution; (5) that the influence of ferrous salts in suppressing the solubility of gold is negligible if manganese dioxide is present; (6) that the solution of gold is practically limited to the oxidized zone.

Book Reviews

Any of the books noticed in this column are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

THE FLOW OF WATER. By Louis Schmeer. Pp. 228. D. Van Nostrand Co., New York. Price $3.

This is a new treatment of an old and much discussed subject, in which the author has endeavored to present his ideas in as simple a manner as possible. It deals with the flow of water in conduits under pressure; in open conduits (cemented ditches, sewers, and the like), and in ditches dug in earth and rock, in all their varied shapes. It contains the necessary mathematical formulas, which have been simplified as far as possible, and explained in clear, comprehensive language. There are also many pages of useful tables to be employed in calculations, and which will make the book useful to the student of hydraulics and to the engineer.

THE CHEMISTRY OF CYANIDE SOLUTIONS RESULTING FROM THE TREATMENT OF ORES. By J. E. Clennell. Pp. 202. McGraw-Hill Book Co., New York. Price $2.50.

In the preparation of this volume the author has reviewed cyanide practice generally and has presented various methods by means of which the constituents of cyanide solutions may be determined at any period of the operation of the process. This is something which will appeal to cyanide operators generally, particularly where it is desirable to make tests in the daily routine of work, where absolute accuracy is not essential, the object being rather quickly to arrive at information which will be a guide to the operator in the conduct of the work from day to day, or as often as necessary. The book is one which will find a ready demand, and will make clear many of the problems that vex the cyanide metallurgist, particularly those less experienced in the business.

MANUAL OF THE CHEMICAL ANALYSIS OF ROCKS. By Henry S. Washington. Pp. 200. John Wiley & Sons. New York. Price $2.

This is the second edition of this excellent and popular book, which is now presented in amplified form. It deals with the constituents of rocks, and the apparatus, reagents, and methods for their determination. Throughout the work has been thoroughly revised and where necessary new details added, its object being to place scientific petrology upon a firm chemical basis. It cannot fail to be of value to the students of this interesting and important branch of chemical investigation.

The Prospector

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

E. L., Rossland, B. C.: Hornblende granite.

A. C. A., Johnsonville, California: Pyroxenite.

E. E. M., Nogales, Arizona: No. 1, a highly silicified metamorphosed rock, probably of igneous origin; contains pyrite and chalcopyrite; No. 2, appears to be from the surface of No. 1, the sulphides being oxidized. The fragments are too small for accurate determination.

MINING AND SCIENTIFIC PRESS.

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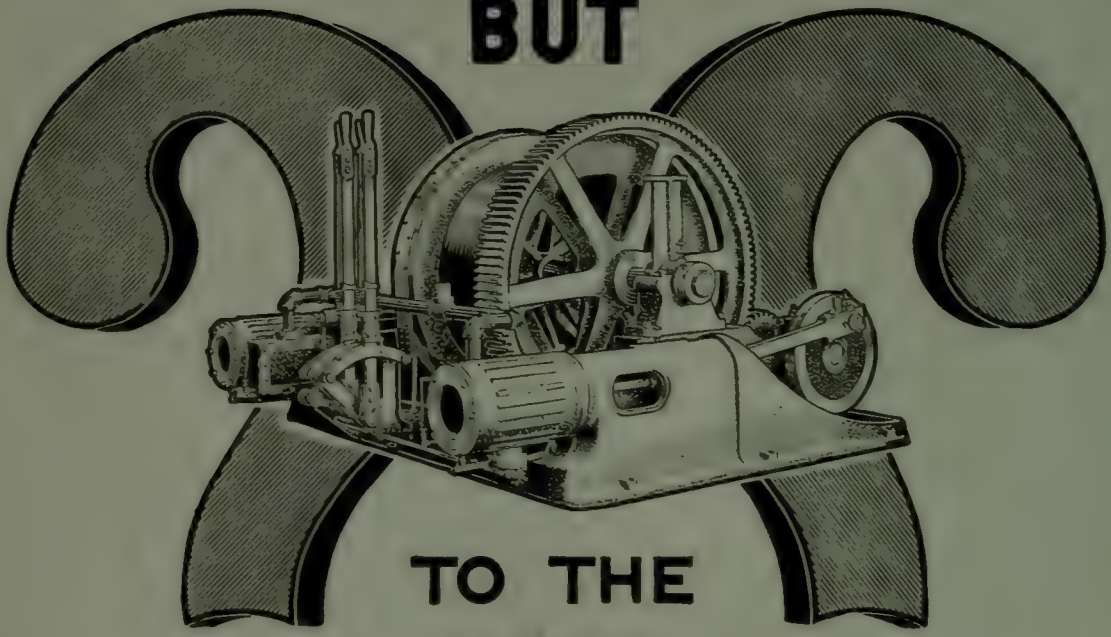

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EDITORIAL

PATENT laws in Australia have been changed in the last year and a lower scale of fees now obtains. In addition but two instead of seven copies of all drawings are now required, though the other five must still be furnished if called for.

STRANGE as it may seem, Colorado has a new mining camp. Beshear, five miles west of Georgetown, one of the oldest mining towns of the State. A townsite has been surveyed and 200 claims located. The discoveries were made by miners from Cripple Creek.

EUROPEAN visible supply of copper was estimated July 18, by James Lewis & Son, at 102,659 long tons, nearly double the stock on January 1, when it amounted to 55,677. European consumption for the first half of 1910, except in Germany, where the figures cover five months only, was placed at 145,527 tons of fine copper.

JAPANESE continue to leave the United States for home, the net excess of arrivals in Japan in two and a half years being 8600. The present arrangement regarding immigration of laborers to the United States seems to be working satisfactorily, and a problem that at one time threatened serious friction has thus been solved by the application of a little common sense.

THE PINE CANYON smelter of the International Smelting & Refining Company in Tooele county, Utah, is about to begin work. The first furnace was fired July 28 and actual smelting will follow as soon as the furnace and stack become thoroughly warm. The International is the most prosperous of the various Cole-Ryan enterprises, and with the new plant in operation should make even larger profits than those reflected in the present 2 per cent quarterly dividends.

'BACK TO THE LAND' is the cry that best meets the questions raised by the increased cost of living, and back to the land a steadily increasing stream of people is moving. During the panic of 1907 land dealers in Denver did a steady business, and in a surprising number of cases purchases were paid for in cash that had evidently been hoarded. Last fall under the auspices of the *Chicago Tribune* a land show was held in the City by the Lake, a show that proved surprisingly popular and started many away from the crowded cities. This autumn a similar exposition is to be held in Pittsburg, the *Gazette-Times* and *Chronicle-Telegraph* standing sponsor. Such movements warrant support. It is perhaps a matter

of individual preference, since we must rise early in any event, whether we do so to catch a suburban express or an unruly cow that has strayed to the far end of a dewy and briar-covered pasture. Whether it is easier to keep a cook in town or a 'hired man' on the farm is an open question. In irrigated districts fruits thrive, but so do mosquitoes, and many a man of sound judgment in business matters, prefers a beer garden to a market garden. Still, however we may look on these matters individually, there is no dispute that as a nation we need more men on the farm, and miners approve heartily all efforts to induce others to raise more foodstuffs.

MINE-RESCUE cars are being built under the direction of the new Federal Mining Bureau. Two have been ordered, one to be stationed at Billings, Montana, and the other probably in Utah. Each will be fully equipped with rescue apparatus and in charge of a competent officer prepared to respond to emergency calls for aid. This is an excellent move. Ultimately the mine-rescue work must be taken up by the States or by associations of mining companies, but for the present there is a large field of activity for the Federal officers in developing and demonstrating the proper methods and apparatus.

CURTAILMENT of the copper output seems actually under way, though having in view the Sherman anti-trust law, each company is acting 'individually.' Apparently the law of supply and demand has not been repealed and the companies find it unprofitable to continue to produce in excess of market requirements. Curtailment is sensible and business-like, and the public has no occasion to quarrel with it. It does not necessarily forecast any further move in the direction of the much discussed copper merger, though it is clear that leading copper producers are constantly being brought closer together by the logic of events.

LOS ANGELES is to have a systematic collection of rocks and ores illustrating the economic geology and mining industry of the tributary region. The matter has been undertaken by the Chamber of Mines and placed in the hands of a committee, of which Mr. J. Nelson Nevius is chairman. Space in the Germain building has been secured and a part of the material is already on exhibition. It is proposed that the collection shall be systematic. Earnest effort is being directed toward making it also truthful and representative. Donations are requested and will be installed and exhibited free of expense, provided that they conform in character to the very reasonable regulations adopted by the committee. The educational value of such collections is unlimited. A well arranged and well displayed collection gives to each visitor a large amount of information in a short time and a basis for correlation of other data derived from reading or conversation. Just as a bit of mineral put in a saturated solution will cause the previously invisible dissolved substances to become apparent by crystallization, so a visit to a museum will orient a vast amount of amorphous information. The specimen in the museum gives the student a starting point and a measuring rod. It makes knowledge practical and effective. For this reason museums are proper objects for public support. The industrial importance of systematic and attractive displays is better understood but still needs emphasis. Southern California, as other parts of the West, needs development, and one of the most effective means of bringing that about is to stimulate interest by such displays illustrating undeveloped resources. The Chamber of Mines has done well to take up the matter, and if the plans of the present committee succeed the result will be an effective agency for publicity of the right sort.

RECENT discovery of rich ore on the 1000-foot level of the Central Eureka mine, at Sutter Creek, California, again emphasizes the advisability of thorough prospecting during development. The Central Eureka was reopened in the early nineties after an idleness of many years. A shaft was sunk in the fissure, but no ore of consequence was found above 1100 feet from the surface. From the next level downward for 1200 feet the vein was extensively stoped and many dividends paid, but owing to increasing cost of operation and legal complications work was eventually discontinued. The mine remained idle until last year when it was reopened. Work has been principally confined to straightening and re-timbering the shaft. Now prospecting has revealed a new shoot of ore where little was expected. It was less than two years ago that in the South Eureka mine, adjoining the Central, a rich vein was discovered in the west country after many years of unprofitable operation on another vein, and the levying of 58 consecutive assessments. Mining on the Mother Lode in California, while no longer 'in its infancy,' still possesses many attractive possibilities.

Settlement of Illinois Labor Difficulties

That coal mining was about to be resumed in Illinois appeared probable at the first of this week. Since then returns from the referendum vote of the miners have made it clear that the suggested compromise will be rejected. It is entirely unlikely, however, that the mines will be idle much longer. The time when there is a natural and active demand for coal in the Middle West is at hand. The suspension has continued since April. This has given about the normal number of days of idleness for the year, and with the return of fall and active demand for coal, the mines must be re-opened or severe loss and hardship incurred. Neither men nor operators are in position to meet these, though both have probably been not unwilling to while away the summer in impressing the other fellow. The actual settlement proposed, and which doubtless nearly outlines the terms that will be finally accepted, involves an advance for the miners in certain districts over and above the terms of the Cincinnati demands. The troublesome shot-firers matter is compromised, the operators agreeing to assume payment provided the cost be limited and the shot-firers protected from Union control or interference. The operators are to

return to the Inter-state Conference and provision is made against calling out engineers, pumpmen, and others essential to the protection of the mines not only during the life of the agreement as provided by the old contract but subsequently. To insure this, jurisdiction over the men concerned is given to the National rather than State organization of the miners. It is this slap at the State officers apparently that has aroused opposition and will necessitate further negotiation.

To mining men away from Illinois the significant facts about this settlement are that after a trial of independent negotiations the operators find it preferable again to become parties to an inter state agreement and the further fact that after repeated conferences with Mr. J. H. Walker and other State leaders of the Union had failed, the settlement has been negotiated by Mr. T. L. Lewis, the International president. That the local men are not yet ready to accept the settlement as a whole does not detract from the fact that the broader view of Union officials outside the State has proved helpful. A further noteworthy fact is that the matter is reaching adjustment by negotiation between the parties in interest, the operators and the men, and not through the services of outside arbitrators. More and more labor contracts are coming to be looked on as business matters pure and simple. Each side strives to get as much as possible and business conditions control the final settlement. We have faith in both the Coal Operators' Associations and the United Mine Workers, and we believe that the approaching affiliation of the latter with the Western Federation of Miners will bring to settlement of vexed labor problems in the West the benefit of experienced and capable negotiators and should be encouraged.

Oil-Land Legislation

Discussion of oil-land legislation is not now active. The great increase in output has set producers skirmishing for markets rather than wells. In California, where legislation regarding public oil lands is of first importance, everyone swears at the Lakeview gusher—and wishes he had one. Producers are divided. Those owning the fee to land, are, in view of market conditions, satisfied with the withdrawal orders of the President, since their present interest lies in checking rather than stimulating development. Temporarily, the interest of the conservationists lies in the same direction. To force development at present would lead to waste and unprofitable business for everybody. Withdrawing land from entry is an effective means of checking development. No other has yet been found except through monopoly of transportation and regulation of price. The operators or would-be operators, who do not own land, but were relying on 'locations,' are not so well satisfied with the situation. Many of them are deserving of sympathy, but more are not. On another page we present a careful account of the actual operation of the old law, by Mr. Forstner, a candid and experienced engineer who writes from the fullness of personal observation. The facts that he presents warrant careful study. It is clear that many claims were not entered in good faith and it is equally clear that the field is not one where a plea may be properly made for the poor prospector. In California, where the oil sands lie deep and a valid discovery necessitates an expenditure of some $25,000 it is evident that the man who stakes a claim without means of developing it is a burden on the industry rather than a help. The situation is not the same as in gold and silver mining where the patient and intelligent effort of the lone wanderer over the desert and mountains results in actual discovery of a vein. The oil industry differs so widely from metal mining that it is the height of folly to attempt to apply to it laws framed for the development of gold placers.

Defenders of the old law belong mainly in two classes, the first being those who expect to profit personally by the location of oil lands, but who, usually, do not have the means to develop a lease. These men fear, and properly, that under any leasing system requirements of work would be so severe as to prevent holding ground long enough to promote a company. The promoter, it may be promptly conceded, while occasionally malodorous, none the less serves a useful function in business economies, and must be considered. It is easier to raise money for drilling when definite bodies of land are controlled and a permanent title is in prospect, than to first raise the money and then find the land on which it can be spent to best advantage. This is true however much better the latter method may really be. The second class of objectors is one that deserves less consideration, though actually more influential. It includes the lawyers in and out of Congress who wish to let well enough alone and who look to further departmental and court decisions to clear away existing difficulties. Their attitude comes from a very accurate knowledge of and wholesome respect for the unsettling of conditions produced by any new law. Decisions rest largely on precedents, and these, like the miner's dependent shots, hang one on the other. A change in the statutes disturbs the whole equilibrium and re-opens many old contentions. It often requires re-fighting old battles, and the wisest lawyer cannot tell the final decision until the Supreme Court has spoken. Knowing the interests involved and the difficulties to be faced, the lawyers are always conservatives when a change of statutes is proposed. Lawyers, however, should serve the law rather than master it. Theirs is the duty of pointing the way and determining rights under the law. In making the law they have only the rights and responsibilities of other citizens. There are limits beyond which it is not wise to attempt by court construction to amplify an inadequate law. Temporarily there is joined to these classes a third, including those who, owning a fee in oil lands, and fearing the effect of additional development on prices are content with things as they are. What the outcome will be cannot be foretold. The situation is sufficiently serious to warrant careful study by all citizens. At the Los Angeles meeting of the Mining Congress a day will be devoted to the discussion of these and related problems. Certainly no more important topic could be chosen.

A Portable Saw-Horse Crane

By Corey C. Brayton

The crane, shown in Fig. 5, is simply a big saw-horse mounted on mine car-wheels and provided with a trolley. It was designed by myself, is original as far as I am concerned, and was improvised for installation of equipment at a mine of which I had charge. It differs in general from the common hand-operated crane only in that the floor of the building rather than the walls support it, and in that it is, to an extent, portable. The equipment at the mine where the crane was built, was electrically driven, all in one building, and consisted of a 140-hp. hoist, a 1000 and a 500-cu.ft. compressor. It was essential,

Fig. 1. Crane and Bed-Plate of Hoist.

Fig. 2. Crane Carrying Ore-Hoist Drum Weighing 6000 Pounds.

knowing the life of the property, to construct as light and cheap a building as possible, and it was desired at the same time to provide a means for installing the equipment and for taking care of repairs. A crane with a span equal to the width of the building and supported by the walls was obviously out of the question. A trolley for each machine supported by the roof and walls was not only out of the question, but also undesirable on account of having but one horizontal line of travel. The saw-horse crane was therefore designed, and the building constructed of the lightest possible framing.

The crane was built for a maximum load of 6000 lb., which was the weight of the heaviest single piece of machinery, and with a span a few inches greater than the width of the widest machine foundation. The arrangement of machines to avoid waste of floor-space necessitated a crane track for each. These rails were spiked to the floor joists before the double floor was laid, and the top of the rail is practically flush with the floor surface and out of the way. Owing to delay in delivery of material the installation was made before the completion of the building, as is shown by two photographs, Fig. 1 and 2. The electric wiring is under the floor and is therefore out of the way of both the crane and the employees.

The crane cost complete, without chain block, $100. The weight is approximately 2000 lb. The material entering into its construction, with the exception of the timber, came from the usual scrap pile found about a mine. The crane handled the installation entirely satisfactorily, and with a great saving in both labor and time. It can still be used in handling heavy pieces while making repairs. For installations of this kind and occasional repairs, it accomplishes exactly the same result as the hand-operated crane; that is, the placing of the load where it is

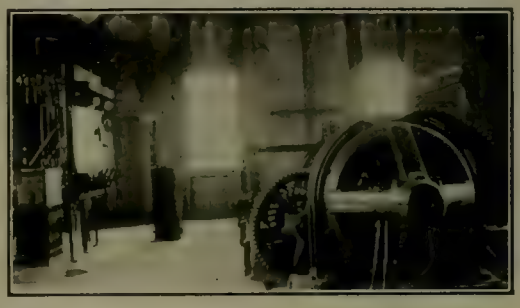


Fig. 3. Interior Showing Hoist, Switchboard, and Light Construction of Building.

Fig. 4. The Two Compressors and Crane.

wanted, is practically as efficient, and is much cheaper. It is far superior to the fixed trolley with only one horizontal line of travel. Fig. 3 and 4 show the machinery in place, and in Fig. 1 is seen the crane standing on the track.

The crane is easily and cheaply built, is readily moved when loaded, requires no extra strength in roof, walls, or floor of the building to support it, and pays for itself even in small installations and repairs. On account of its portability it can be made to serve several machines in the same building. At a small additional cost it could be built to handle double the load and could also be provided with means to facilitate the two horizontal movements of the load.

In general, mining machinery, such as hoists and compressors, is installed by a swarm of men using main strength, rollers, jacks, and pinch bars, with occasionally the aid of a chain-block suspended from shears, temporary frame work, or some other fixed support, and heavy repairs are made in much the same way. Such work is not only expensive and

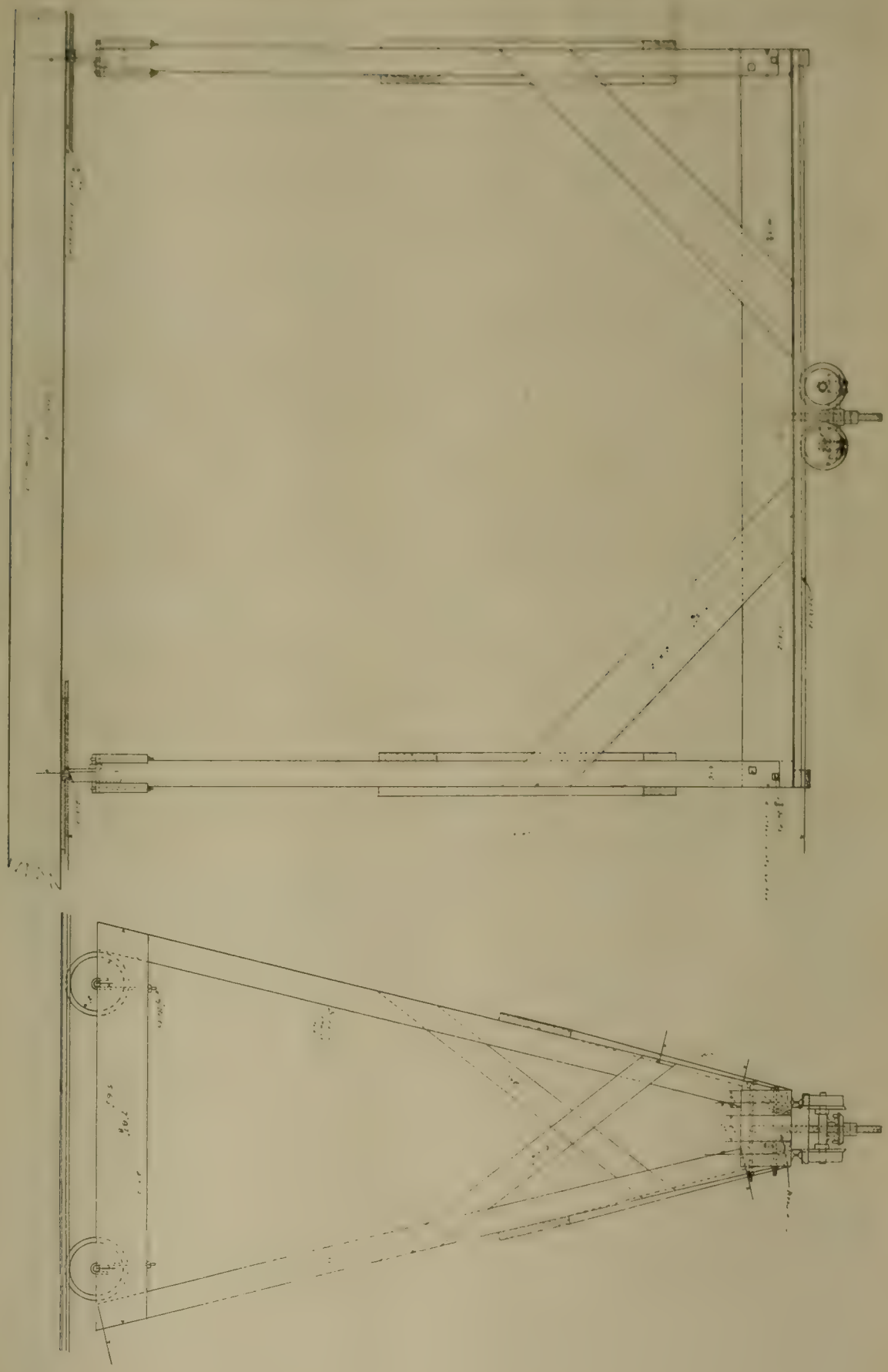


Fig. 5. Dimension Drawing of Crane.

slow, but also offers a considerable chance for breakage through accidents. Tfiis crane can be adapted to nearly all ordinary mine-machinery installations and repairs, and to a great variety of other machinery installations and repairs. In certain cases, of course, character of installation, frequency of repairs, weight of machines, or permanency of installation and building, warrant a trolley, or some type of overhead crane. There are other uses to which a cheaply constructed contrivance of this kind can be put.

Radersburg District, Montana

Recent developments in the mining district of Radersburg, ten miles southwesterly from Toston, in Broadwater county, Montana, has for the past year been attracting attention. Radersburg is an old camp, which forty years ago was being worked vigorously and with profit, the ores of the oxidized zone yielding $40 per ton and upward, in stamp-mills. With the penetration of the sulphides at about 100 ft. from the surface the ore was found to be no longer amenable to simple amalgamation, and as one mine after the other reached the region of sulphides, the activities of the district waned. It was at Toston that W. Lawrence Austin made his first attempt at pyrite smelting; an attempt that fell only a little short of commercial success. After all these years capital has again been interested and a new period of prosperity has come. The accompanying map shows the location of the important mines of the district. The principal work has been done in low foothills southwest of the town, 4500 ft. above sea-level. As usual in the West, the first mining was for placer gold, the production of which probably amounted to several hundred thousand dollars. Quartz mining began in the '70s on the oxidized ores. In recent years sulphide ores of the camp have been in demand by the smelters at Butte and East Helena, and the resulting low treatment rates have encouraged renewed activity in the district. At present several companies are operating and the camp gives promise of becoming a steady producer.

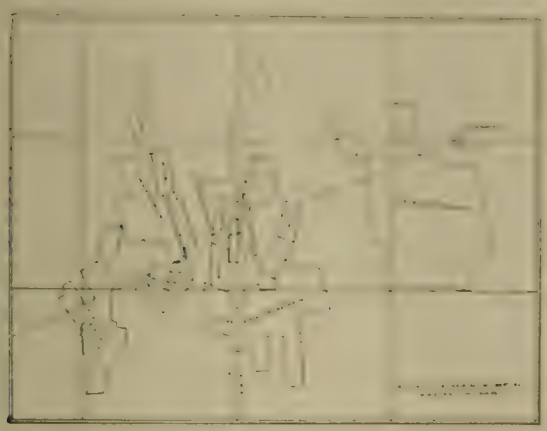
The Keating Gold Mining Co. is the largest operator. It has a vertical shaft 350 ft. deep, and an inclined shaft, on the vein, about completed to a depth of 600 ft. The property is being equipped for a production of 100 tons and over per day. The Black Friday Gold Mining Co., the next largest operator, has an inclined shaft 500 ft. deep, which is soon to be sunk deeper. The property is being equipped for a production of 30 to 50 tons per day. The Ohio-Keating, Rena, and Etta properties are in the development stage.

The Radersburg ores are found in narrow fissure veins in eruptive rocks. The veins strike north-south, usually, and dip steeply to the west. They are little faulted. The unoxidized vein-matter consists of auriferous pyrite in a gangue of calcite and quartz. Chalcopyrite, sphalerite, galena, marcasite, pyrrhotite, and chalcocite occur rarely. Fourteen miles west of Radersburg is the Elkhorn district, and the eastern edge of the batholith of granite, in which occur the Butte ore deposits. At Elkhorn is found a stratigraphic section extending from the Algonkian to the Cretaceous, occurring as the west side of a synclinal fold with north-south axis. Passing east, toward Radersburg, the syncline is succeeded by a well developed anticline across which a section is exposed down to the Algonkian and up again from Algonkian to Cretaceous, and into Tertiary strata (Bozeman lake-beds). On the east side of this anticline, at the horizon of the Cretaceous rocks, is found the Radersburg mineralization. An extensive zone of igneous rocks breaking through Cretaceous shales, sandstones, and limestones, occurs here, trending northerly and southerly, and extending for at least twenty miles. These rocks consist of diorite, andesite, with less abundant felsite and rhyolite. The mineralization occurs in these igneous rocks, or associated with them. The geological relations of the igneous rocks are complicated and have not been worked out. Some of the andesites and felsitic rocks may be surface flows, though most of them appear to be intrusive. Secondary enrichment of the oxidized ores is not marked. A ton of oxidized ore may be richer than the underlying sulphide, but this can be accounted for by the fact that it takes about twice the volume of the oxidized ores to make a ton as it does of the sulphides. There is no indication of decrease of value in the veins to the present depths. In fact, the Black Friday ore-shoots appear to have increased in size and value with depth. Tertiary lake-beds conceal the underlying rocks over much of the district. In these lake-beds numerous hot-spring deposits occur. The veins of these hot-spring deposits are calcite veins, having usually the same strike and dip as the productive veins. By following the strike of some of the productive veins into the lake-beds the tufas of the hot-spring deposits are found. These facts suggest that the hot-spring deposits may represent a stage of the mineralization of the producing veins, as they both have the same gangue, namely calcite. Incidentally a unique question involving the mine location laws has been raised here. The hot-spring deposits contain sufficient gold to permit a valid lode location. The surface tufas spreading out from the hot-spring vents or veins are integral parts of the lode, though lying flat on the surface of the lake-beds; that is, the tufas are as much a part of the veins, in the light of their genesis, as are the vertical veins along which the solutions ascended. The question arises whether a location made on the surface tufas without exposing the vertical vents is valid. If so, the matter becomes complicated, since the tufa has the lake-bed clays for a foot-wall and the sky for a hanging.

The Ohio-Keating Con. M. Co. is developing a vein on the Ohio claim which is readily traceable on the surface for half a mile. It strikes N. 10 to 20° W., dipping a little to the west. The vein varies from a seam to 4 ft., averaging 16 in. The oxidized ores of the upper portion of the vein were little stoped years ago. It now has a 220-ft. shaft on the vein, with a drift at 110 ft., which runs north 216 ft. and south 37 ft. At the face of this latter drift the vein is displaced by a transverse fault, the throw being to the west. A large number of samples taken

in this drift and in the shaft extends for a width of $16.25 per ton which is almost exclusively gold in pyrite. Gangue minerals quartz and calcite occur in relatively small amount. A second shaft has been sunk 120 ft. north of that above referred to to a depth of 40 ft. where some stoping has been done. Shaft No. 3 is 500 ft. north of No. 2 and here stoping have also been made to the surface in the oxidized ore. The vein occurs in a series of lenses the walls repeatedly closing the fissure to a seam and opening again to several feet. A remarkable and fortunate thing is not readily explained, the fact that the richer places in the vein are the richer the ore ranging in grade from $2.50 to $74.40.

A glance at the map will discover a number of long lath shaped claims. These were located in early days when claims were 2200 ft. long and 100 ft. wide. One of these is the Keating claim of the Keating Gold Mining Co. on which the deepest shaft has been sunk 600 ft. A vertical shaft has been sunk 450 ft.



The longest level is 1250 ft. on a vein of solid pyrite, averaging $15.50 per ton. In one portion of the vein a stope has been opened continuously for a distance of 840 feet.

Another important development is found on the Black Friday vein, owned by the Black Friday Gold Mining Co. This vein is somewhat different from the other veins of the camp, in that the fissure is accompanied by a gouge in places, indicating a differential movement of the rock walls, that is, there has evidently been greater movement of the walls at those places where the gouge is present than elsewhere along the vein. To this movement is ascribed the fact that oxidation has extended to greater depth in the Black Friday than in the other claims, and the change from the oxidized zone to that of the sulphides is less abrupt. The enclosing rock is described as andesite, in which is noticeable numerous phenocrysts of feldspar, and the walls are impregnated to some extent with pyrite, and the jointing planes and fractures of the rock are similarly mineralized. The statement is made that since June, 1909, there have been shipped from below the 200-ft. level, 1150 tons of ore having a gross value of over $50 per ton. This vein, like the others of the camp, is narrow, in hard rock, and occurs as a series of relatively long flat lenses. Mining cost is estimated at $15 per ton.

The cost of operating in this district is variously estimated the figures ranging from $8.75 to $20 per ton including mining, transportation and smelting. There is no doubt that the treatment of the ores of this district at the mines will be of great advantage to the economical operation of these properties and without doubt this will be done. The present opinion seems to be that the grinding, roasting and cyaniding will successfully treat the ore and a test run is that the low sulphides may be amenable to treatment by chloridation, but of course this has to be demonstrated. The information contained in this abstracted data is from reports made by W. L. Crouch and D. C. Bard of Butte, C. W. Purington of Denver and R. B. Lamb, of New York.

Acquisition of Public Oil Lands

By Whitney Eastwood

During the last months numerous articles have appeared in various daily and weekly publications in California, attacking the withdrawals from entry of lands within the supposed belt of oil-bearing lands in California, ordered by the Government during the years 1908 and 1909. As the validity of these withdrawals is a matter of doubt, projects of law were proposed in Congress to cover this point, and these projects have found so much opposition among the oil men in California that a delegation went to Washington to protest against the adoption of any law validating these withdrawals. In fact, it appears that a large majority of the oil men desire to have the present mode of acquiring title from the Government to oil lands remain in force. Before entering into a discussion as to what would be the most desirable method of disposing of the probable oil lands still remaining within the jurisdiction of the Government, it appears to me important to place before the reader the former law and regulations under which oil lands were entered, and the practical result of their operation, and then the new law passed at the end of the recent session of Congress, to show what new conditions have been created by its enactment.

The act of Congress of February 11, 1897, stipulates that "any person authorized to enter lands under the mining laws of the United States may enter and obtain patent to lands containing petroleum, or other mineral oils, and chiefly valuable therefor, under the provisions of the laws relating to placer-mineral claims." Section 2329, Revised Statutes of the United States, stipulates that: "Claims usually called 'placers,' including all forms of deposit, excepting veins of quartz, or other rock in place, shall be subject to entry and patent, under like circumstances and conditions, and upon similar proceedings, as are provided for vein or lode claims." Section 2320, in prescribing the manner in which lode claims shall be located, contains the following: "but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located."

That discovery of mineral is required to validate

a location has been so repeatedly held by the courts, that this point may be considered as placed beyond controversy. No title is then acquired by the mere act of locating an oil placer claim on vacant Government land, and no right of exclusive occupation on such a claim is obtained until the discovery of 'mineral,' (here oil), has been made on such claim.

This point is apparently lost sight of by those who claim that by changing the present method of disposing of those lands, the Government will deprive the poor prospector of the chance of making money. The intent of the law of May 10, 1872, and of the law of 1866, which it superseded, was undoubtedly to encourage development of the mineral resources of the country, not to retard it by allowing parties to locate large tracts of land without performing any development work, thus preventing others willing to develop the land from doing so, by exposing them to the chance of litigation after they have succeeded in proving the land valuable.

To protect his right such locator, or association of locators, must "with diligence prosecute the work toward a discovery." "To constitute such a discovery of oil by boring beneath the surface."—Miller v. Christman, 140 Cal., p. 440. Even then, in the same case, the court held that "the discovery, when made subsequently, operates to perfect the location against all the world, save those whose bona fide rights have intervened," and further, "where there is an absence of discovery of oil within a prior location, and no work is done to protect the possession of the prior locators, their location is void, and subsequent locators entering openly and peaceably in good faith, and making another location, which they proceed to protect by diligent prosecution of work to the discovery of oil in paying quantities, acquire a valid title as against the prior locators."

It will be seen from the above that under the former law, until the discovery of oil was made, diligent operation of the work toward a discovery was an essential requisite to protect the right of possession of the locator.

This was, however, entirely lost sight of by the great majority of locators. They assumed that the perfunctory performance of the annual labor of at least $100 worth of work, or improvements, prescribed by section 2324 of the Revised Statutes, was sufficient to hold possession of the located claim, not taking into consideration that discovery was a prerequisite to perfect their right of occupancy. This annual labor was also, in nearly every case, of the most perfunctory character, and consisted either in building a cabin, generally unfit for habitation, or the erection of a 'stub-derrick,' consisting of four short batterposts on blocks with light braces and entirely unfit for actual work, showing that the intent of these locators was not to perform the work required to discover oil, but solely to hold the claims at the least expense, with a view to disposing of their assumed rights to parties willing to do this work.

Undoubtedly a number of bona fide locations were made in the oilfields, but I believe to be well within the limits when I state that nine-tenths of the locations were not made with any intent to develop the land, but purely and simply with the purpose to prevent others from locating the land, and to force any party who actually desired to develop the land to pay them a sum of money, or to surrender them a part of the land after patent was obtained, which cannot be considered as otherwise than extortion, because those parties were not receiving any valuable consideration, but had to submit to this arrangement in order to enter into peaceful possession, while the locator had, in fact, not the slightest legal right to claim exclusive possession.

In order to show to what an extent this locating of Government land, without making any effort to develop the land so claimed, had been carried on, a list of acreages located by a number of groups of locators is given:

	Acres.
One group on January 1, 1908	39,040
Another group on " " "	4,480
" " " " " "	7,040
" " " " " "	6,400
" " in December "	3,280
" " on January 1, 1909	4,620
" " " " " "	1,920
" " " " " "	2,400
" " " " " "	3,040
" " in March "	5,920
" " " May "	4,840
" " " " "	4,320
" " " " "	3,840
" " " June "	2,560
" " " July "	2,640
" " " September "	18,240
" " " " "	3,640
" " " " "	3,520
" " " " "	3,840
" " on January 1, 1910	9,440
" " " " " "	6,400
" " " " " "	7,520

Nearly all these locations were made at a distance from existing producing wells, in territories where the actual underground conditions were unknown, and it is fair to assume that the average cost of a well under these conditions would be in excess of $25,000. As on every 160-acre tract one well had to be in actual process of development to answer the requirements of the law, it is clear that not one of these associations of locators showed a bona fide intent to proceed in the actual development of the lands they located. A great number of these locators cover the same lands; often as many as five and six locations have been filed on one quarter section. Many of these locations cover lands held by agricultural patent, or lands on which agricultural claims of various kinds—homestead entry, desert land entry, forest lieu selections and State selections—have been filed.

The uncertainty as to what rights any location carried with it was further complicated by the question whether when an association of eight locators have transferred their interests to another party, and this party, individual or corporation, makes a discovery, such discovery entitles to patent for the 160 acres containing the eight associated claims or only for the 20 acres forming the claim on which the discovery was made. Section 2330 of the Revised Statutes declares that no location of a placer claim made after July 9, 1870, shall exceed 160 acres for

any one person or association of persons, and section 2331 provides that after May 10 1872 no such location shall include more than 20 acres for each individual claimant. In Cook v. Klonos 164 Fed. 570 Oct. '08 the United States Circuit Court of Appeals held "when the scheme is used to secure an interest in a claim for a single individual in excess of the limit of 20 acres, it is plainly in violation of the letter of the law, and when all locators had knowledge of the concealed interest and were parties to the transaction it renders the location void." In July 1909 the Department of the Interior rendered a decision, H. H. Yard et al., 38 L. D. 59 holding that where eight persons made a location without a discovery, and seven of them transferred their claims to one of the locators, or to another person, and such locator or other person made a subsequent discovery, that in such event such discovery would be a new one, under which a location of 20 acres only could be made by the persons making the discovery.

Considering the chaotic condition in which the whole question of the title to oil lands, held by virtue of location, was at the time, which had been repeatedly called to the attention of the Department of the Interior by its different bureaus, it is but logical that steps were taken to effect a better regulation, which finally resulted in the land withdrawal act passed in the latter part of June, 1910, by Congress. See *Mining and Scientific Press*, July 9, 1910, page 59.

By section 2 of this act the rights of the various claimants are distinctly regulated. It confirms "a bona fide occupant of oil and gas-bearing lands, who at the date of withdrawal is in diligent prosecution of work leading to the discovery of oil and gas" in his rights "so long as such occupant or claimant shall continue in diligent prosecution of such work," and further, specifically, those who have initiated rights or claims upon such oil or gas-bearing lands prior to the passage of this act. The objections made against this act appear to me largely unfounded.

The main objection is that the Southern Pacific Railroad Company will be unduly benefited by its provisions, due to the fact that it owns through a large portion of the oil and gas-bearing lands in the San Joaquin valley, the uneven sections, and that by drilling those sections it will practically exhaust the oil supply of the entire territory. This argument has found a strong response due to the inimical state of mind of the public toward corporations in general. To bear out the contention of this argument, however, a much higher mobility must be attributed to the oil in the oil-bearing strata than is really the case. Such high mobility is assumed by some writers in public print, for instance, in a recent technical oil paper, criticizing the fact that in the withdrawal act similar rules were prescribed for both coal and oil-bearing lands, the statement was made that coal was stable in its location, in contradistinction to "oil which floats around." It is outside of the scope of this article to get into a technical discussion regarding the distance to which an oil-well drains adjacent territory; but while admitting that oil can and does move through the strata wherein it is confined, this mobility is relatively small and the migration of the oil through the sand is not rapid enough to cause a depletion of the oil-bearing strata by a well at a great distance from that well. This fact has been repeatedly proved by operations in the field. Although there are no data to determine the distance from a particular well at which its influence ceases, which distance naturally depends largely upon the physical character of the oil sands, the assumption that a line of wells surrounding a section would be able to drain an important portion of the oil contained within that section is not at all sustained by actually observed facts.

Another objection against the withdrawal law is, that it only protects the locator who is diligently prosecuting the work of development, and thereby crowds out the locator whose means prevent him from doing so. Drilling for oil is expensive, especially in unproved territory, and a locator or association of locators, with limited means, are therefore handicapped. But bearing in mind the state of affairs existing prior to the passage of this law, the frauds attempted under the former law, the efforts to hold large acreages, as above noted, also to get patents on large acreages of oil lands under the pretext of gypsum discoveries, it appears to me that this drastic measure to prevent the continuance of these practises was perfectly justified.

As already stated in the editorial of the *Mining and Scientific Press*, in the issue of July 9, 1910, page 36, this is only a temporary law, until an adequate law for the disposition of oil and gas-bearing lands, belonging to the United States, can be framed and passed by Congress. I have already discussed some of the principles on which, in my opinion, such law must be based, in my article critisizing the project of law offered by S. C. Smith, Representative from California; see the *Mining and Scientific Press* of July 10, 1909, page 52.

Phosphate rock in bulk is shipped in large amounts from the southern ports of the United States into Rotterdam, and while large quantities are re-shipped up the Rhine into Germany, the Dutch factories consume probably 60,000 to 70,000 tons per year. All of these phosphates are on the Dutch free list and pay no import duty. In the Netherlands there are several large fertilizer works, manufacturing for the home market as well as for export. Aside from the factories already in operation, a plant with an annual output of some 30,000 tons of prepared fertilizers is under construction and will be ready to contract for its supplies of Florida raw material by the end of the present year. While the products of Christmas Island, Panope, and other sources of supply in the Pacific seldom find their way into this market, the Florida exports nevertheless have serious competition to meet. Large deposits are being worked in Tunis and Algeria, a Dutch firm having an important concession there. These African phosphates seldom run better than 55 to 60% pure, while the best grades from Florida will go over 75%. Aside from the lower price due to lesser purity, the item of cheap labor at the mines and shorter ocean transportation is in favor of the African producers.

Concentration of Slime—I

By Edwin A. Sperry

INTRODUCTION

In considering the treatment of slime by concentration, there are many things which come up for discussion and comparison. Such a discussion necessarily commences with the methods employed in the work of crushing the ore and passes along through the various steps of the operation of preparation, to the final treatment of the slimed ore and the recovery of the metals in a marketable form. The subject will be discussed under five heads in their natural sequence. These heads are: (1) crushing and grinding; (2) sizing; (3) classification; (4) dewatering; (5) final treatment.

Crushing and Grinding.—While the word 'crushing' is employed in this heading, it will not be used in reference to coarse-crushing machines, such as rock breakers, but will be applied to those employed in reducing the ore to less than 30-mesh, 30 wire (0.02-in. or 0.5-mm. open space). Sizes coarser than this come under coarse concentration and are, therefore, outside the scope of this paper. A definite classification of the various sizes to accord with the different lines of treatment which can be applied, based on practical lines, may be made as follows:

1. **Coarse,** or that size which can ordinarily be treated by jigs and including from the coarsest down to 30-mesh, 30 wire (0.02 in. 0.5 mm. open space).

2. **Sand,** or that size which, passing 30-mesh, remains on 100-mesh, 38 wire (0.004 in. or 0.1 mm. open space). This size is readily treated on the common form of concentrator such as the Card or Wilfley.

3. **Fine,** or that size which, passing 100-mesh remains on 200-mesh, 45 wire (0.002 in. or 0.05 mm. open space). This size is readily treated on the Frue vanner, Wilfley slime table, Sperry slime table, and various other machines used for this purpose. The principal reason, however, for making this division is based on the speed of settling in a body of water. Ore particles between 100 and 200-mesh have an appreciable ponderosity and on this account will settle readily, and are easily separated from the finer size and easily treated.

4. **Slime,** or the very finest size. The term 'slime' means widely different things to different people. In previous discussions three distinct points of view have appeared: (1) The purely practical, according to which slime is considered to be that portion of the ore that is so fine as to make it unfit for treatment on the common forms of concentrators: this is ordinarily placed at minus 100 mesh, and the division is based on a dividing line between the different methods of treatment. (2) The second point of view occupies an intermediate position between the practical and technical. The definition here might be stated as including that portion of the ore which, on account of its fineness, requires considerable time to settle in a body of water. This, if stated in terms of mesh, might more closely approach 200, but this is merely relative and given as a matter of comparison. This definition is practical in that it recognizes a division between quickly and slowly settling particles, and technical in so far as it recognizes a condition beyond terms of mesh in which specific gravity plays but little part. (3) The last and purely technical, is one according to which the particles are of such fineness that they lose their individual integrity and, in combination with water, approach, if they do not merge into, the colloidal condition of a hydrate, which changes their form and nature.

In the following discussion, the intermediate position will be assumed as more nearly conforming to the conditions to be met in practice.

In the crushing of ore, one of two results is aimed at, one being the least possible production of slime, the other, the complete reduction of the ore to this condition. In the discussion of the various types of machines for crushing and grinding, the crushing action, as well as the machines mentioned as examples, will be given as nearly as possible, in the order in which they theoretically occur, beginning with those which would give the least proportion of slime, and ending with those which would be most efficient in the reduction of the entire amount to slime. They will be first discussed from as nearly a theoretical standpoint as possible, analyzing the action of the machines themselves, and they will be placed, as nearly as possible, in their natural order as regards practical results.

In theoretical order, it happens, the Huntington mill stands ahead of the Chilean mill but, owing to the inferior method of screening in the Huntington, the order will be reversed. This will be more fully dealt with later.

The subject of crushing will be first taken up under the separate heads noted below. The different crushing actions may be classified as follows:

CHARACTER OF CRUSHING ACTION RELATIVE TO THEORETICAL PROPORTION OF SLIME PRODUCED

Elemental crushing action.	Derived actions.
1. Projectile.	1. Pressure-impact.
2. Pressure.	2. Pressure-torsion.
3. Impact.	3. Impact-torsion.
4. Torsion.	4. Impact-grinding.
5. Grinding.	

These may be placed in order of theoretical production of slime, based merely on the action itself, but subject to change from modifying conditions arising from individual action of the machine as follows: (1) projectile—Marx mill; (2) pressure—rolls; (3) impact—stamps (California practice); (4) pressure-impact—Huntington, Wild; (5) pressure-torsion—Chilean mill, triplex rolls; (6) impact-torsion—stamps (Gilpin county practice); (7) torsion—disc-grinders; (8) impact-grinding—tube-mills, ball-mills; (9) grinding—cone grinders.

(1) **Projectile.**—This action is ideal for the disintegration of the ore as the resulting impact against the 'anvil' has simply a shattering effect. The shattering is naturally along the lines of cleavage and is nearly in conformity with crystalization. Several attempts have been made to adapt this principle but no thoroughly successful machine has yet been evolved. One machine of this type, however, has been recently presented which gives promise of good results—the Marx pulverizer. It is still experimental but shows points of interest.

(2) **Pressure.**—Rolls, in ordinary practice, exem-

plify this action as nearly as possible and stand at the head of the machines of this class. By the term 'ordinary practice' is meant the common type of rolls in contradistinction to high speed rolls. These were run at so high a peripheral speed as to approach the action of impact rather than of pressure. Triplex rolls are placed in another class as will be explained later.

3 **Impact.**—As rolls are an example of pressure action so the stamps stand for impact. This contemplates the simple reciprocating motion without the rotating motion which is sometimes given them, especially in Gilpin county practice. This will be spoken of later. A distinction is made between California and Gilpin county methods. In the California mill stamps weigh approximately 1000 lb., drop 100 per minute, with height of drop 7 in., height of issue 2 to 4 in.* With these dimensions and speeds the delivery of pulp from the battery is rapid and as a consequence the removal of undersized particles is more thorough. Even with this rapid delivery there is much of the undersize which remains in the crushing zone but, owing to the rapid drop and consequently excessive splash, these will not readily remain on the die to be struck again. In feeding the stamps the proportion of slime can be influenced. If the feeding is high the ore is crushed against itself and is not so finely pulverized as it is when 'iron strikes iron,' as the expression is. Then, too, if plenty of water is used the undersized particles are the more readily washed out through the screen. By careful manipulation stamps can be made to crush very uniformly, with a small proportion of slime.

4 **Pressure-Impact.**—In the Huntington, the Griffin, and the Wild mills, we have examples of this action. In these machines crushing is done on the inside of a large ring by the pressure, generated by centrifugal force; a muller in the form of a small cylinder rolling against the ring. In one form, the Huntington and Griffin, the ring and muller lie in a horizontal plane and the pressure is generated by centrifugal force. In the other form, the Wild, the ring and muller are in a vertical plane and the pressure is that of gravity. The compound action of pressure-impact is accorded these machines as the rolling-pressure action of the mullers is often combined with jumping of the muller, the return of which to contact with the ring develops considerable impact. This is due to the fact that the mullers are not rigid and are free to recede. In the first form the ore, after crushing, is thrown vertically and then, by vanes, horizontally to the screens. In the Wild it is thrown, at once, horizontally, to the screen. In comparing the two actions the difference in the efficiency of these mills, due to these causes, will be appreciated by millmen, the Wild mill conforming more nearly, if not quite, to the theoretical.

(5) **Pressure-Torsion.**—This action is shown in the Chilean mill and in the Triplex rolls. It is the result of rolling a short cylindrical-shaped body in a circular direction on the face of the disc or flat ring. As the muller is a cylinder, and not a cone, its line of contact with the horizontal plate is equidistant from its axis and as this contact line is always radial to the disc or ring there is a constant twisting motion between the two surfaces. The weight of the rolling member in the Chilean and the pressure of the spring in the Triplex rolls with the torsional or twisting action described, give the 'pressure torsion' combination. While these two machines are theoretically in the same class, the lower screening capacity of the Chilean places it below the Triplex in the practical order. The pure torsional action would be more highly productive of slime but as it is slight in both cases mentioned, it does not enter largely into the consideration of results. The Triplex rolls have the advantage of an immediate removal of the ore from the crushing zone and, as in the case of ordinary rolls, the undersize is isolated at once, nothing but the oversize being returned to the crushing zone, at least, such should be the case.

(6) **Impact-Torsion.**—Gilpin county stamps are used as an example of machine using this combination. In comparison with the California stamp the general form will be given. The stamps weigh 650 lb., drop 30 per minute, from a height of 17 in., with height of issue 10 to 15 in. Owing to the height and upward slowness of the motion of the stamp, the cam has an opportunity to give the stamp a spinning or whirling motion, and in descending it strikes the die with a twist. This gives the combination of 'impact-torsion.' The torsion is not great, but more than in the Chilean mill. The slow action of the stamp, together with the great depth of the issue, causes fine grinding which places it far down in the practical scale.

(7) **Torsion.**—There are no machines which use a strictly torsional action in crushing ore, the nearest approach to it being the disc grinder, composed of two discs revolving in opposite directions. The ore is fed at the centre between them. The discs are slightly dished in shape, that portion near the edge having parallel faces. They are so arranged that these faces are a certain distance apart and are set up when the wear increases the space. The circular motion of the discs gives a twisting motion which is most effective in crushing. This form of machine is not much used as the wear on the crushing faces is excessive and the power consumed is relatively large.

(8) **Impact Grinding.**—The tube or pebble mill, is used as an example of the application of this combination. The general form is a tube, ordinarily 14 ft. long by 5 ft. diam.; lined to protect the outer shell of the mill, usually with silica brick, or some such material. The tube is charged with several tons of rounded flint pebbles of 3 to 4 in. diam. The ore is fed at one end and the tube revolved. As the pebbles roll and fall down from the ascending side, the ore is caught between them and eventually ground into a slime, when it is discharged from the other end. The object of this machine is to reduce everything to slime and it is considered one of the most effective devices for this purpose. The ball-mill is a modification of the tube-mill with the substitution of steel balls for pebbles and steel lining in place of the silex brick. It is designed for dry

*The Gilpin county data will be given later.

grinding and is used extensively in cement manufacture.

(9) **Grinding.**—This action is exemplified in the ordinary sample or cone grinder. Its action differs from disc grinders in that the moving surface passes the fixed plates in practically straight lines, causing a simple rolling motion without torsion. It is so designed that by adjustment, the grinding surfaces gradually approach each other until they are in contact. This machine has no practical value in metallurgical operations outside of the laboratory.

With this short discussion of the various actions the comparisons of practical results can be more readily understood. It is an extremely difficult matter to make any specific statement as to what machine will produce the greatest amount of slime, for, to determine this point, it would be necessary to operate all of them on the same ore and under the same conditions. The only way to reach a conclusion is to analyze the crushing action and then, by a consideration of the manner in which the ore is delivered from the crushing zone, as regards its promptness, a fair idea can be gained as to its efficiency. One statement can be made which needs no argument, and that is, that it matters not what machine or what action is employed in the crushing of ore, the amount of slime produced is largely, if not entirely, influenced by the promptness and thoroughness of the removal of the undersized material from the crushing or grinding zone. From this point of view, and from this only, can proper comparison be made between machines of different type. Based on this statement, it can be readily assumed that rolls would produce less slime than stamps, even of the California type, and the Chilean mill less than the Huntington. As to the stamps and the Chilean, it would depend on the manner of operating the stamps. With proper use the stamps produce less slime. While the Wild mill uses the same crushing action as the Huntington, it can be placed ahead of stamps, owing to its prompt delivery, and it would be fair to suppose that the Triplex rolls would be superior to the stamps.

A general statement concerning the machines cited can be made, however, by placing them in one of three classes: (1) those best adapted to crushing without producing slime; (2) those which occupy an intermediate position and can be used for either purpose according to conditions; (3) those especially adapted to the reduction of all the ore, or practically all, to slime. They may be classified according to this plan, as follows:

1.	2.	3.
1. Rolls.	4. Stamps.	7. Disc-grinder.
2. Triplex rolls.	5. Chilean mill.	8. Tube-mill.
3. Wild mill.	6. Huntington mill.	

Many styles of crushing machines might be cited, but only those more commonly known have been used in comparison, it being more especially the present object, to define the various actions and results by reference to well known forms. From these it is hoped that analysis of action and results may be readily applied to such machines as may be met in special cases.

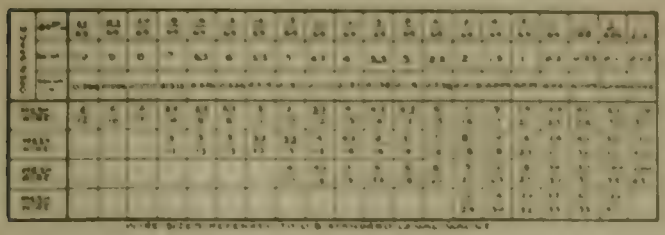
SIZING

Sizing is the separation of ore particles into classes having the same diameter, within a certain range, regardless of their specific gravity. Sizes are best specified by using two screen meshes. For instance, if it is stated that certain particles are 30-60 mesh, it is to be understood that they pass a 30 and remain on a 60-mesh screen. It is customary to designate a screen as '30-mesh' or '60-mesh' when from centre to centre of wires it is $^1/_{30}$ or $^1/_{60}$ of an inch. In other words there are 30 or 60 meshes to a linear inch. This term is indeterminate as the size of the wire has to be considered. In stating the size of a screen in terms of mesh it is always wise to designate the size of the open space and size of wire, as these are vital points. There is a method of designating screen sizes, which is coming into vogue, and by its use there is no chance for a doubt as to the space. It is the use of metric terms in designating the size of the open space direct. It should be encouraged, and were it not for the unfamiliarity of the public with the comparative value of the metric measurements, it would be more universally adopted.

There is no department in metallurgical work where there is so much confusion and misunderstanding as in the designation of sizes of screens. A great deal has been written on the subject, but there seems to be still room for some definite system of terms. The Institution of Mining and Metallurgy has put out a standard list, and for some few purposes it is commendable. In the presentation it stated that the design was simply for use in laboratory work in order that results could be based on some uniform system of sizes. It was based on a standard size of wire for each mesh, but it is obvious that this standard could not be carried into practical mill work and this fact was recognized by the Institute. The reason for this can be briefly stated. There is work in which heavy service is required of screens having the same open space as there should be in others which require as high a percentage of open area as possible. As an illustration the screen of a trommel needs to be heavy to insure a reasonable length of life. In the jig cell handling the oversize from this trommel the open area should be as great as possible and on this account lighter wire can and should be used. Other cases might be cited, but this will illustrate the point.

In the average mind the term '30-mesh,' or whatever it might be designated, has a specific value and all that is necessary is to order or specify by this simple and ambiguous method. At many of the larger mills this confusion does not exist, as all the screen lines are worked out on definite statements of 'open space.' Even then, there has been but little information to guide the designer or operator in the selection of screens which have the required weight and space for the purposes for which it is intended, in order to fulfil the conditions of the service it is designed to meet. There is no greater need of care in any department of milling than in the selection of a screen line, so designed that the particles may be sized within the most desirable range. A failure to select the most advantageous sizes and ranges has contributed, in many cases, most seriously to failure,

A fixed system of determining what open space is most efficient would be of great value to the designer as well as to the operator



A table has been prepared which is herewith presented, in which the open space is given in sixty fourths of an inch, in millimetres, and in decimals of an inch, starting from what is termed '2-mesh' and ending with '200-mesh,' under each head, giving size of open space. In one column several mesh values are given with the gauge number of the wire which would give the open space at the head of the column. For instance, in the column headed $^{1}/_{64}$ 1 0.039, the open space would be $^{1}/_{64}$ in., 1 mm. or 0.039 in. Running down the column it appears that 14-mesh with No. 21 wire, 16-mesh with No. 23 wire, 18-mesh with No. 27 wire, or 20-mesh with No. 32 wire would all give the open space designated at the head.

With this table at hand, a line of screens may be readily and quickly worked out and the weight of the wire selected to meet the various services required. The wire in the larger sizes is calculated to $^{1}/_{1000}$ of an inch, which is as close as it could be approached in ordinary application or manufacture. In the finer meshes it is practically correct. Inasmuch as there is considerable of a variation between the several gauges it would be well to establish a fixed standard in this regard. There is but little difference between the English legal and the American legal standard gauge, and either could be used without materially affecting the results.

From the nature of the case, sizing is necessarily done by screens. It is only within the last few years that screening has been successful for sizes finer than 30-mesh, 30-wire. The shaking or impact screen has made it possible to screen successfully as fine as 100-mesh, 38-wire. Of this type are the Impact, Imperial, Wild, and Centripact screens. The Impact employs a simple upward 'bump' at right angles to the screen, which, as the screen is placed on a slope, gives the ore a toss and lands it a little lower on the screening surface. The Imperial has a combination of horizontal and vertical motions, and as the ore is tossed, the screen recedes horizontally beneath it so that the ore lands at a point lower down on the screening surface. The Wild has a swinging motion without a bump, and advances the ore by a series of tosses. On the Centripact screen the ore progresses from the centre to the edge of a circular screen by a series of tips imparted by a revolving ratchet. They are all open to a similar objection—the necessity of many wearing parts.

Another type of screen has been introduced which bids fair to take a prominent position. It might be called a washing screen, as the pulp is distributed over the surface of a moving screen and moved forward to and under a spray which washes the undersize down through the screen, leaving the oversize to be discharged at the tail end of the machine. No agitation is needed in this type of machine, dependence being placed on the spray to remove the undersize. There are two forms in which this type has appeared, the first being that of an endless belt of screen-cloth having a slow progressive motion as in the Callow screen, the other being virtually an inverted trommel, screening from 'out to in' instead of from 'in to out,' as in the King screen.

J. M. Callow, of Salt Lake, thus describes the Callow screen: "The fundamental principle of this machine is a traveling belt of screen-cloth, over which the ore and its carrying water is spread by means of distributing aprons or feed soles. This belt of screen-cloth passes over the head and tail-rollers, and the belt is caused to travel continuously in a horizontal direction at a speed varying from 15 to 30 ft. per min., according to the nature and quantity of the material to be screened. These feed soles or aprons play a most important part in the operation of the machine, and its successful and proper operation depends in a great measure upon this feature, as well as on its proper construction and adjustment. It is with this that a preliminary sizing is done, for, as the particles, which are of all sorts and sizes, fall from the lip, the coarsest pieces, having the greatest trajectory, strike the screen at a point far ahead of the smaller ones, leaving a space behind free and unincumbered, which permits the free passage of the fine material and water. Simultaneously with this action the cloth is moving forward and the deposit of oversize is continuously removed from the separating or screening zone, and thus the machine continues to perform its function so long as it is kept moving and is supplied with the feed. Beyond the screening zone, the deposit of oversize is carried forward and passes under a shaking spray of clear water, where any remaining traces of slime or of fine adhering particles are washed off and pass through with the water from the spray into the undersize hopper beneath. Continuing, the oversize still clinging to the screen-cloth, passes in front of a small impinging spray which is situated about the mid-diameter of the front roller, and the oversize is there washed off the screen-cloth into the oversize hopper below."

Foresters divide all the oaks into two distinct groups—the white oak and the black oak group. One way of distinguishing the two is by the fact that the black oaks require two years to mature their acorns, while the white oaks take but one. The woods of the two groups of oaks are also structurally different. The true white oak, known to botanists as *Quercus alba*, is merely one of the species which make up the white oak group. Red oak, on the other hand, belongs to the black oak group. Red oak has a number of common names, among them mountain oak, black oak, and Spanish oak. There is much confusion in the use of names of the oaks.

Diamond Mines of Arkansas

By John L. Cowan

If it were announced, upon unquestionable authority, that diamonds had been discovered in probably important quantities in Patagonia, or Labrador, or the frozen wastes that Peary traversed and Cook didn't traverse en route to the Pole, half the world would go diamond mad; and men would pawn their watches or mortgage their farms in order to try their luck in a gamble of such tremendous possibilities. Yet gem experts of acknowledged ability and integrity are responsible for the statement that the surface finds in the Arkansas diamond fields exceed anything that was discovered in the South African mines at a corresponding period in their exploitation; that the diamonds recovered fully equal those of the De Beers Consolidated mines in average value per carat; that the haphazard washing operations so far performed have yielded greater returns from the amount of material handled than some of the great mines of Africa give; and that the diamond-bearing formation may reasonably be expected to extend so far into the earth that operations will be limited only by engineering and economic considerations; and no great stampede has taken place. The discovery of diamonds in Arkansas was announced more than three years ago, and officially confirmed in publications of the United States Geological Survey. It caused no excitement, excepting among the farmers of the immediate neighborhood; and has aroused less comment than the commonplace announcement of another Pittsburg divorce scandal. Perhaps this cold-blooded reception of news that ought to have created a sensation was due to a deep-seated conviction that nothing good could come out of Arkansas. Or perhaps the American people have been educated to believe that it is only far-away birds that have fine feathers, and that if diamonds existed so close to trolley cars and civilization they would have been adorning the short-fronts of our captains of industry, head waiters, and green-goods artists long ere this.

Washing Plant.

In 1906 John M. Huddleston bought a tract of land in Pike county, Arkansas, two and a half miles from Murfreesboro, and 120 miles from Little Rock. In places the soil presented a peculiar appearance, being stained in curious hues of green and blue, leading Mr. Huddleston to suspect that copper, lead, or other valuable minerals or metals might be found in the neighborhood. On the first day of August, as he was down on his hands and knees looking for indications of these, he picked up small crystal, which he suspected might be a diamond, although he was not sure. That afternoon he started to ride into Murfreesboro, when he saw a second crystal lying in a rut by the roadside. He dismounted and secured this also. The crystals he showed to a jeweler in Little Rock, who pronounced them genuine diamonds, the first one weighing four and a half carats, and the other weighing three carats. Mr. Huddleston and his family immediately began a still hunt for diamonds, examining the ground where the first stones had been found with minute care. No more stones were found until September 8, when another was picked up. Then people in Little Rock began to take notice, and Sam W. Reyburn, Charles S. Stifft, and Albert D. Cohn started an investigation on their own account. They found that the region in which the Huddleston farm was situated had been described as a volcanic area as long ago as in 1842, by W. B. Powell; and that J. C. Branner and R. N. Brackett, of the Arkansas

Testing Plant.

Peridotite Area, Arkansas Diamond Field.

Geological Survey had commented upon the finds in 1890 as consisting of decomposed peridotite and possibly diamond bearing. That the diamonds of South Africa occur in peridotite is well known. The men mentioned secured an option on the Huddleston farm and went to New York City to consult with George F. Kunz, America's most famous gem expert.

Mr. Kunz pronounced the stones shown him to be diamonds beyond the shadow of a doubt, and recommended that Henry S. Washington be employed, if possible, to examine the locality, determine whether the diamonds were found in the original rock formation, and report upon the probable extent of the diamond-bearing area. Mr. Washington made a careful and exhaustive examination of the locality, and later Mr. Kunz visited the ground and spent some time there for the same purpose. Soon afterward John T. Fuller, for five years connected with the De Beers Consolidated mines, first in the capacity of mining engineer and later as mine manager, visited Pike county, with the same object. Messrs. Kunz and Washington read a paper on 'Diamonds in Arkansas' at the New York meeting of the American Institute of Mining Engineers, February 1908, and also supplied one on the 'Occurrence of Diamonds in Arkansas' for publication by the United States Geological Survey in 'Mineral Resources of the United States for 1906.' In the latter they stated that the "occurrence of diamonds in the peridotite of Murfreesboro may be regarded as unquestionable;" that "most of the stones are white, a large proportion being of good water and the white of exceptional purity, finer than most African stones;" and that "this is the only place outside of South Africa where diamonds have been found in peridotite." This official recognition places the Arkansas diamond mines safely beyond suspicion.

Whether the diamonds are abundant enough to justify extensive mining operations and a costly washing plant remains to be seen. This point can be settled definitely and beyond doubt or question only by the expenditure of time, capital, and labor necessary to find out. Upon this phase of the subject the judgment of a practical mining engineer, whose experience was gained in the world's greatest diamond mines ought to be of some value. It is this consideration that makes Mr. Fuller's report interesting and important. He states that the peridotite in which the Murfreesboro diamonds are found occurs in a true volcanic 'pipe', similar to those of South Africa; that this 'pipe' will extend vertically for an unknown depth into the earth, so that mining operations will be limited in depth only by economic and engineering considerations, and not at all by a failure in continuity of the deposit; that the known diamond-bearing area is approximately 60 acres in extent; and that the indications from the slight operations so far carried on point to an average yield of 0.21 carat per truckload of 16 cubic feet excavated from the pipe. As the great Jagersfontein mine of the Kimberley district averages only 0.13 carat per truck-load, and others of the South African mines fall below the estimate made for the Arkansas mines, Mr. Fuller's report may fairly be considered equivalent to a prediction that Murfreesboro is destined to become one of the world's great gem mining centres. The Roberts Victor mine, discovered in 1903 and considered one of the coming mines of the Transvaal, yields 0.70 carat per load of 16 cubic feet. The owners of the Arkansas diamond mine, the Murfreesboro property upon which the greatest amount of development work has been done, believe that their property will do as well.

Following the public announcement of Mr. Huddleston's discovery of real diamonds, the farmers of Pike county began a frenzied search for similar crystals upon their own lands, and people might be seen in every field and along every fence-row, down on hands and knees searching in the dirt and gravel for gems. The ordinary labors of the farms were neglected, for who would dig potatoes or hoe corn when diamonds might be picked from the surface? Altogether more than a thousand gems have been found so far, most of these coming from the Huddleston and adjoining properties. Numerous diamond-mining companies have been organized, and some of these are selling stock and making extravagant claims for properties far away from the volcanic pipe, where the presence of diamonds (unless carried there) would be a mineralogical miracle. Some of these diamond-mining companies are making preparations to work the deposits in a thorough and systematic manner, in the confident expectation of building up in Arkansas a great, permanent, and profitable gem mining industry. Others evidently have no other object in view than to 'work' the public, and sink the proceeds of sales of stock deep into the pockets of the promoters, rather than into shafts and drill-holes.

Thus it appears that the long-sought American diamond field has been found. Its extent and value are yet wholly problematical, but indications point to the existence of an important deposit of the most desired of all gems. The geology of the region is so well known that the discovery of more than one pipe of volcanic blue ground is hardly to be hoped for, though the extent of the original pipe is not known and kimberlite is reported to have been found under cover more than a half mile to the east. Probably the Arkansas diamond fields will never rival those of South Africa in extent. Nevertheless it is not impossible that the single pipe that has been discovered will prove as rich as any similar one in South Africa. No large stones have yet been found in Arkansas. The largest so far recovered weighed six and a half carats, and the average weight of the first fifty stones found was about half a carat. Of course, the larger the stone the greater the value per carat; but a compensating circumstance is found in the fact that the market for small stones is constant and practically unlimited, while the demand for large stones is uncertain and variable. During the recent financial depression, the De Beers, Dutoitspan, and Jagersfontein mines, which produce mostly small stones, operated continuously, while the Premier, and other mines that produce many stones of large size, closed down on account of great accumulations of unsold gems.

Theory of the Dissolution of Metals by Cyanide

By J. B. Stuart

Not long ago the tendency of those cyaniding silver ores was to rely upon a maximum degree of dilution to accomplish the maximum extraction, believing that the rate at which the silver went into solution was accelerated thereby. Hence they tried to use as many tons of barren solution per ton of slime as possible. Later this idea gave way to better practice, and the primary reason for the large bulk of solution required was found to be merely the need of washing the dissolved metals from the charge. With the perfection of filter plants, as against decantation plants, it became apparent that washing of dissolved gold and silver by dilution was by no means as perfect in the agitation and decantation method as in its displacement by the filtration methods of washing. Then it was appreciated to what extent mechanical-agitation methods suffered, from revolution *en masse* of solution and solids. In the case of filter methods of washing, there could be no doubt that the barren solution, or water, actually displaced the metal-bearing solution, retained as moisture in the cake. On the other hand, a quantity of barren solution, or water, several times as great as that used in filter methods, failed to accomplish anything like so satisfactory a 'wash' when applied by mechanical-agitation methods. This, I take it, points very clearly to the need of maintaining as high a difference between the relative velocities of slime particles and solution as possible; and the primary object of such methods I consider is to promote the diffusion of the dissolved metal from the immediate surface of the slime particles to the general mass of solution involved in the charges.

TABLE OF SURFACE AREA OF PARTICLES

Screen No.	Screen coef.	Per cent max. surface exp.	Sq. m. sur. per 1 m. ton sp. gr. 25	Sq. m. sur. per cu. m.
10	1	3.03	960	2400
20	4	6.06	1920	4800
30	9	9.09	2880	7200
40	16	12.12	3840	9600
50	25	15.15	4800	12000
60	36	18.18	5760	14400
80	64	24.24	7680	19200
100	100	30.30	9600	24000
110	121	33.33	10560	26400
120	144	36.36	11520	28800
130	169	39.39	12480	31200
140	196	42.42	13440	33600
150	225	45.45	14400	36000
160	256	48.48	15360	38400
170	289	51.51	16320	40800
180	324	54.54	17280	43200
190	361	57.57	18240	45600
200	400	60.60	19200	48000
250	625	75.75	24000	60000
300	900	90.90	28800	72000
330	1000	100.00	31680	79200

To illustrate the increased efficiency obtained in treatment by moving the solution relatively faster or slower than the slime particles, the following comparison was made of treatment by the Brown or Pachuca tank method and that of mechanically-rotated paddle-agitation assisted by vanes on sides of the tank and one 4-in. air-lift at one side. To make the comparison a little more satisfactory, the screen tests on the charge were reduced to a single figure representing the mesh number of a uniform material which would present the same surface per ton for contact with solution, as that indicated by the screen tests. Perhaps others may like to use the same method, so I will further explain it. For purposes of comparison only, and to eliminate difficulties due to irregularities in size of wire and air spaces, I speak of '10-mesh' as cubes of 1 10-in. on a side and '100-mesh' as cubes of 1/100-in. on a side. Under these conditions, then, material of 2.5 sp. gr. would present the surface as indicated in the table above.

If, now, in any screen test the percentage remaining on each screen is multiplied by the corresponding percentage area for that size, and the percentage passing 200 mesh be considered as all remaining on 250 mesh and multiplied accordingly, this will determine the average screen size. The sum of all these products gives the total surface exposed for contact with solution. Take the following example:

On 10-mesh	1% × 3.03 =	0.0303%	of total area.
40 "	4% × 12.12 =	0.4848%	"
80 "	8% × 24.24 =	1.9390%	"
100 "	10% × 30.30 =	3.0300%	"
150 "	15% × 45.45 =	6.8170%	"
200 "	20% × 60.60 =	12.1200%	"
250 "	42% × 75.75 =	31.8000%	"
		56.2211%	

From this it may be concluded that the screen tests indicate material of average size a trifle coarser than 190 mesh exposes 56.22% of the maximum surface possible. Although not strictly correct, still, when dealing always with the same ore, it may be said 56% of the gold and silver content of the ore would be exposed by such size material for complete extraction.

In my Pachuca-tank test, the charge showed material equivalent to 146 mesh, assaying 237 gm. Ag per metric ton, in a dilution of 1 to 1½, yielding 77% extraction in 36 hours agitation. This implies 44.24% (14.6 by 3.03) of the total surface was exposed or 104.84 gm. Ag per ton were readily accessible to the solution. In the mechanically-rotated paddle-agitation assisted by one 4-in. air-lift, the charge showed material equivalent to 187 mesh, assaying 397 gm. per metric ton, in a dilution of 1 : 35, yielding 70% extraction in 33 hours agitation. The surface exposed was 56.66% (18.7 by 3.03) of the total possible, and 224.7 gm. Ag per ton were readily accessible for dissolution.

I claim that in the Pachuca-tank treatment 32.76% (77%—44.24) of the content was extracted from imperfectly exposed Ag; and that by the other treatment only 13.34% (70—56.66) of the content was extracted from imperfectly exposed material.

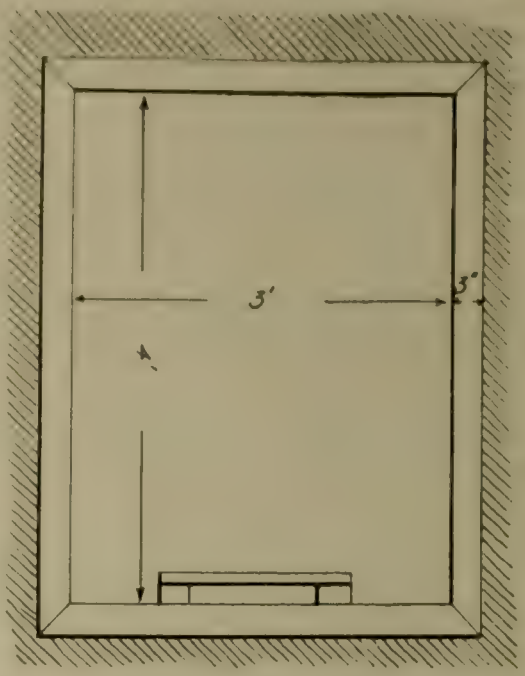
Inasmuch as the two charges did not assay the same, further investigation is desirable. In the first

case, to get 77% of 237 gm 182.49 had to be dissolved, and of this, 104.8 were free; hence 77.7 gm was dissolved from imperfectly exposed material assaying 132.2 gm per ton. 237 - 104.8 = making the extraction of this material only 58.8%. Applying the same methods to the mechanical agitation experiment it is found 277.9 gm had to be dissolved out of 397 present to get 70%, of which 224.7 gm was free, leaving 53.2 gm. 277.9 - 224.7 to be dissolved from a total of 172.3 gm of imperfectly exposed Ag, which corresponds to an efficiency of 30.7% on this imperfectly exposed silver. It is obviously easier to obtain any given percentage extraction upon a high grade ore than on a low grade ore, so the limit to which tailing value may be reduced in a given time is of more importance than the mere percentage extraction obtained. Thus it becomes clear that the extraction by the air-lift tanks is far more satisfactory than that made in rotary paddle agitation. The latest advance in this direction is the Just process in which the charge is practically only kept in a distended condition with just enough disturbance to cause diffusion of the enriched solution from the surfaces of the slime particles to the general mass of solution occupying the interstitial space. The advantages offered by the Just process over the Pachuca-tank treatment are many, and obvious to all engaged in operation of cyanide plants. Its universal adoption is only dependent upon further proof that the silica-sponge false-bottom will not gradually become choked. Under normal conditions, it appears to be free from this danger, as only air is passing through it and no lime-water gets to the pores. But how about the effect of frequent shut-downs for lack of power so common in many camps? When the blower stops, the charge begins to settle and the slime and lime-bearing solution are bound to find their way into the porous tiles to a considerable degree. With the pressure of a well settled slime charge it would be strange if the pores of the tile did not become more or less clogged and the hydraulic lime, so universal in Mexico, is likely to make a pretty firm deposit in a short time. After such a shut-down, it is possible that the extra air-pressure necessary to break through the densely packed sandy slime of a reground product may occasionally break a tile. Or it may be that the pressure required to break up the charge will be greater than that obtainable from the blower used. This would be a great disadvantage indeed, if compressed air had to be used from time to time, as it is one of the strong points in favor of the Just process that it operates perfectly with a blower, instead of a compressor. The moderate volume of air used in ordinary practice must, no doubt, be a great factor in reducing cyanide consumption to a minimum.

The Illinois Geological Survey has prepared a map of the Sandoval oilfield, which shows an extensive dome within the —200-ft contour, measured from the No. 6 coal. The oil already found lies within or near the —125-ft. contour, but the remaining area is thought to be prospective value. It is further believed that the dome is not isolated.

LINING FOR MANWAY THROUGH WASTE

The accompanying sketch shows a simple method of lining a manway through broken ore or waste adapted to high rock-filled stopes in Los Pilares mine, Nacozari, Mexico. No framed timbers are employed. Planking 3 by 12 in. are fitted snugly with bevel joints at the corners. The pressure of the set



Details of Manway.

tling mass of broken rock holds the lining firmly in place. Considerable care is required in stowing the rock around the boards as the manway is carried above the level of the filling. The ladder strips are spiked to the planking, and no difficulty is experienced in maintaining alignment. In fact the ladders assist in stiffening the lining.

NEW TOPOGRAPHIC MAPS

The topographic maps named below were issued by the United States Geological Survey during the months of April, May, and June, 1910:

Antietam, Md.-Va.-W. Va.
Bedford, Pa.
*Bisbee, Ariz.
Bloomington, Ind.
Breckenridge Special, Colo.
*Burnet, Texas
Carson Sink, Nev.
Castle, Cal.
Clay, W. Va.
Conesville, Ohio
Eugene, Ore.
Fish Springs, Utah
*Furnace Creek, Cal.-Nev.
Grand Hogback, Colo.
Granville, Ohio
Gressaway, W. Va.
Hogdon, Mo.
Isleton, Cal.
Jenson, Utah-Colo.
Linden, Tex.
Montgomery, W. Va.
Mound, La.
Pawhuska, Okla.
Pleasant Grove, Cal.
Rangely, Colo.
Ray, Ariz.
Rock Springs, Wyo.
Stony Creek, N. Y.
*United States Relief Map 18 by 28 in.
*Waterloo, Wis.
White River, Colo.
York, Pa.
Yosemite National Park adm. map
Zillah, Wash.

An asterisk (*) indicates a new edition of an old map.

The United States relief map sells for 10c., the Yosemite National Park administrative map sells for 25c.; the other sheets mentioned for 5c. each.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

A shoveler who fills 15 ordinary mine-cars on a shift is doing good work. Many of them fail to accomplish as much as this.

Failure of the steam or air safety valve to blow off promptly when the steam gauge indicates the pressure at which the valve should release, calls for prompt examination into the cause.

A fall of 8 in. to the 12-ft. box is the usual grade of placer sluices. Some material requires a heavier fall than this, and it may be necessary to give the boxes more slant owing to scarcity of water.

Safety valves on boilers should be frequently tested, as they often become rusty and are then likely to stick on the seat. The outlet of each safety valve should be the full size of the valve opening.

California is notably a gold-mining State, but there are no very large stamp-mills in the State. The largest contains but 120 stamps, and there are few of 100. The usual number under a single roof is 40 or 60.

A switch should always be placed between the motor and the transformers where machinery is driven by electricity, as this will save much time and insure safety in case of burning out fuses or accident to the motor itself.

Steam and compressed air may be employed together in the cylinder of a steam engine to advantage if it is convenient to do so, and contrary to expectation the condensation of steam under such conditions is much less than is generally supposed.

Amalgam may be removed from plates with an ordinary glazier's knife. Indeed, there is no better utensil with which to do the work. The knife is far superior to the hoe-shaped and straight-edged chisels generally made from old files, and used for this purpose. The putty knife has the advantage of elasticity, which the file chisel lacks, to its detriment.

The South Pass district, Wyoming, is in the south central part of Fremont county, in the central portion of the State, and at the south end of the Wind River range of mountains. Gold was discovered in this district in 1842, but it was not until 1870 that actual mining of consequence was done. In that year the placers that would pay were practically worked out, and a number of quartz veins discovered.

Platinum prices are very unstable, varying between $18 and $30 per ounce. Figures given by the United States Geological Survey vary between $4 and $7 per ounce for the crude material between the years 1880 and 1900. From the latter date to the present the price for the refined metal has ranged from $20 to $30 per ounce, the lowest year being 1905, with an average of $16.75, and the highest 1906, when the average price was $30.70.

Cinnabar is a sulphide of mercury, HgS, and when pure contains 86.2% of mercury. It is very heavy, its specific gravity being 8 to 8.2; it occurs in bright vermillion to brownish-red masses of granular texture; more rarely as small transparent rhombohedral crystals, as a bright scarlet powder, or as an earthy red mass. Easy tests are: heat the powder in a closed tube when a sublimate of mercury, or a 'mirror,' will form in the cooler part of the tube, or if cinnabar powder is moistened with hydrochloric acid and rubbed on a bright copper, the coin will be coated with mercury.

The deepest vertical shaft in America at any gold mine is the Kennedy, at Jackson, California, which is 3450 feet. There are deeper shafts in gold mines at Bendigo, Australia, and on the Rand, South Africa. The deepest vertical shaft in the world at present is the Tamarack No. 3, near Houghton, Michigan. It is 5253 ft. deep, lacking 27 ft. of being a mile. No. 5 shaft of the Tamarack company is 5089 ft. deep. The deepest shaft of the Calumet & Hecla mine, adjoining the Tamarack, is the Red Jacket, 4920 ft. deep. For a long time this was the deepest shaft in the world, but has been superseded in this by the Tamarack shafts.

Danger is always present when high-pressure boilers are used unless they are given frequent and proper inspection. At the beginning and end of each watch the man on shift should ascertain if the valves between the boiler and water column, as indicated in the gauge glass, are open. Open the lower cock and close again noting the return of water to the glass. Test the gauge-cocks thoroughly until absolutely sure of the water-level in the boiler. Open the door to the boiler end daily and examine carefully every inch of surface exposed for leaks, particularly the tube ends, seams, and blow-off pipe. If any leaks are discovered they should be repaired without delay.

Tantalum is used in steel making, but the utility of tantalum-steel alloys is as yet undetermined; at least its metallurgy may be said still to be in the experimental stage. Iron alloyed with 5 to 10% tantalum is hard, but is ductile. Scientific investigators have experimented with a number of tantalum-steel alloys, but have thus far found them of no commercial value. It is thought that possibly had the steel contained a higher percentage of carbon more satisfactory results might have been obtained. Tantalum has the strange property of transforming an alternating into a direct current. With 120 volts or less, two electrodes of tantalum dipped into a bath of dilute sulphuric acid will completely stop an alternating electric current, but if one of the tantalum electrodes be replaced by one of platinum, the current will continue to flow, but in one direction only. The uses for tantalum are increasing and in time it may occupy a much more important place in metallurgy than at present.

Special Correspondence

JOHANNESBURG, TRANSVAAL

Another Power Scheme — Vogelstein's Consolidated Deep

The electrification of Transvaal industries is one of the most discussed topics in South Africa at present. The passing of the Power Bill and the advancement of construction work at the Victoria Falls Power Co.'s station at Germiston have quickened interest in the matter, and now the flotation of another huge undertaking, which will supply power throughout the Pretoria and Middelburg districts, has rendered the matter more vital than ever. The opposition of "backward Boers to anything in the nature of industrial advancement seems to be weakening down and in the face of the manifest advantages that will accrue to the country through the employment of electrical power generated from water-falls, collieries and the progressive and sympathetic attitude adopted by the leaders of the Dutch in Parliament, it is not to be wondered at that ignorant prejudice is waning. The new power project referred to above is popularly termed the Tweefontein Power scheme, but it is understood that the power venture has for the time being, the title of the Transvaal Hydraulic Syndicate. Application has been made for a license, under act No. 15 of 1910 of the Transvaal to erect and install machinery and plant and to carry on and engage in an undertaking for the supply of power from a generating station, to be erected upon the farm Tweefontein No. 236, in the Middelburg district. It is proposed to form a company with a nominal capital of £926,000 (cash working capital £842,000), vendors £84,000, for the purpose of taking over and operating the undertaking. An area of 20 acres will be purchased by the Power Syndicate, from the Tweefontein Colliery, Ltd., the Syndicate contracting to purchase from the Colliery, a minimum of 25,000 tons per month of small coal, pickings, and second class coal, over a long period of years, at an agreed and satisfactory price to both parties. The business may be regarded as favorable to both the Colliery owners and the Power Syndicate. The former will be able to dispose of all fines and pickings, the great majority of which at present represents waste product, while the generating station will be actually on the site of a colliery, and use will be made of the cheapest possible material in the production of electricity. The estimated cost of generation on a basis of 36,000 kw. years is as follows:

Coal, 450,000 tons, at 4s. per ton..	£ 90,000
Salaries and wages	24,105
Depreciation and maintenance...	20,000
Interest and amortization.... ...	83,340
Oil and stores....	7,750
Water	5,000
Total	£230,195

This is equal to £6 7s. 10d. per kw. year, or 175d per kw. hour. The minimum amount of power it is intended to sell to any one customer is 45,000 kw.-hours per annum. It is proposed by the promoters of the project to supply power to all classes of consumers (mining, municipal, industrial, and agricultural), within the Pretoria, Middelburg, and Witbank areas. Among the concerns mentioned in this connection, are the Premier Diamond mine, South African railways and workshops, Middelburg and Witbank collieries, Modderfontein dynamite factory, a proposed electro-chemical works at Tweefontein, the military cantonments, Roberts Heights, and the Olifantsfontein pottery works. The scheme is evidently most comprehensive and ambitious, and in conjunction with the Victoria Falls Power Co.'s stations on the Rand, it should do much for industry in Central South Africa.

No other property on the Witwatersrand has occasioned so much disappointment of recent years as the Vogelstein's Consolidated Deep, a mine situated near Florida, and controlled by the firm of S. Neumann & Co. The company started milling in January of the year and for the first five months of 1910 has recorded a total loss of £8,39. The Vogelstein Deep has in fact been the bad egg of the Witwatersrand and the disappointing grade of ore encountered coupled with the high rate of working expenses have had a depressing effect on the Kaffir market. Some idea of the extent of the losses incurred in the venture may be gathered from the fact that early last year the shares were quoted at 45s. 6d. whereas today they stand at only 6s. The company has had a most chequered career has been reconstructed three or four times and is today saddled with liabilities amounting to over £1,000,000. Two days ago a circular was issued to shareholders inviting them to subscribe for £250,000 six per cent. first mortgage debentures at par. The circular says that in the event of the new issue not being fully subscribed by the 15th inst. it will be proportionately reduced to that amount. The sum of money asked for if provided will be applied to development and the enlarging of the crushing plant from 10,000 to 15,000 tons capacity per month. The poor results so far obtained are ascribed to the presence of a bad hanging wall which has resulted in an abnormally large stoping width, and therefore a low grade of ore, and also because of high working costs due to inability to supply the mill at full capacity. The payable ore reserves are now estimated to be on South Reef, 170,000 tons assaying 5.4 dwt., 27 in. wide; on Main Reef, 15,000 tons, assaying 7 dwt., 78 in. wide. The directors state that the milling of these reserves should yield profits, provided the plant were supplied to full capacity which, owing to the limited number of stope faces available, is not, however, possible. Clearly, a vigorous policy of development and production on a larger basis is the only alternative to closing down the mine. Why the directors should deem 15,000 tons a month a sufficiently large stamping basis, is difficult to understand. On such a scale of operations, the profit can scarcely be anything of much consequence. The mine is clearly a low grade property, and now that it is imperative to reorganize the policy of the Vogelstein Deep, it would probably be better for all concerned to once and for all develop and equip the venture on a basis commensurate with its low grade possibilities. The expenditure of £210,000 can hardly be expected to achieve this.

LONDON

Fume Question in Cornwall.—Safety in Cornish Mining.—Mexican Mines in London. —Mond Nickel. — Waihi Grand Junction —Great Fitzroy Difficulties.

The revival of activity at the Wheal Jane mine, in Cornwall, has caused difficulties with neighboring farmers, for the company is roasting the tin concentrate for the purpose of decomposing the iron pyrite preliminary to a second concentration. The pyrite contains a good deal of arsenic also, though apparently not sufficient to make it worth saving. The roasting is done at the old Carnon Chemical Works, in the Bissoe valley. The Redruth council has taken the matter up, and Alfred C. Fryer, the inspector under the Alkali Act, has visited the works. Some modifications have been made in the process, though up to the present time, no official action has been taken. The South Crofty company, at Camborne, has also received much opposition by the local farmers, owing to the fumes from the roasting and arsenic furnaces. Here the arsenic is a valuable by-product. The company has spent money on additional settling flues and on higher chimneys. An action against it will come on in the courts at the end of July, and the exact facts of the case will then be made public.

The Royal Commission on Safety in Metalliferous Mines has already held several sittings, and some most interesting evidence has been given by J. S. Martin, who recently retired from the position of inspector of the southern district, which includes Cornwall. As regards the safety of working in Cornish mines, he frankly admitted that conditions were far from ideal, but he saw little chance of their being improved in any important way. The mines

are not blessed with much capital, or with rich ore-shoots. He said that if sufficient capital was assured, and if philanthropy was the paramount consideration, he would advise the sinking of new shafts on modern lines, and levels on the same generous scale. There are, indeed, few shafts in Cornwall to which an engineer can point with pride. Dolcoath has spent £60,000 in sinking a new shaft, and more will be required for its equipment. This work has been going on for years, and connection with the old shaft has only recently been made. The ventilation has thereby been improved, but no hauling or pumping has yet been done by the new shaft. The worst of it is that the new shaft is circular, and brick-lined, though it goes through hard granite. The consulting engineers who recommended this form were identified solely with coal mining, which, owing to the softness and wateriness of the overlying strata, demands this shape of shaft. Therefore, in quoting examples of modern practice in mining, we usually conveniently forget the new shaft at Dolcoath. The new shaft and cross-cuts at South Crofty, would undoubtedly pass Mr. Martin's ideal requirements, and so would the work at Wheal Kitty, which, though on a much smaller scale, is a pattern of modern economic methods. With these exceptions, Mr. Martin's structures and reflections are only too well deserved.

Another Mexican gold and silver property is to be introduced in London. This has been acquired by the Associated Northern Blocks, one of the Landau mines at Kalgoorlie, which is arriving at a period when exhaustion has to be seriously considered. W. E. Simpson has been in Mexico for some time, looking for mines, and that which he has recommended is in Zacatecas, close to the Benito Juarez. It is an old mine and the ore is amenable to the modern cyanide process.

Zacatecas, Mexico.

The Mond Nickel company was formed ten years ago to acquire nickel-copper mines at Sudbury, Ontario, and to refine the matte at Clydach, Swansea, by the late Ludwig Mond's process, according to which the nickel is removed as a volatile carbonyl compound, while the copper is subsequently obtained as sulphate. At first the refining process gave much trouble; it is intricate as well as dangerous. During the first three years the inventor, who had originally taken his purchase consideration in ordinary and deferred shares, decided to pay the dividends on the preferred shares out of his own pocket, as the process had taken much longer to perfect than he had contemplated. The issued capital of the company is £400,000 in preferred shares, carrying a cumulative dividend of 7%, £300,000 in ordinary shares, and £50,000 in deferred shares. During the year ended April 30, 1904, the company earned sufficient profit to pay the preference dividend; the year after saw a dividend of 6% on the ordinary shares; and for the year 1905-6 the deferred shares received 18%. The ordinary dividend was 10% in 1905-6, 12% in 1906-7, and 15% regularly since. The dividend on the deferred shares rose to 33% in 1906-7, and has been 48% since. The report for the year ended April 30, last, shows a net profit of £114,106, figures which are almost identical with those of the two previous years. The company does not give any figures relating to the production of copper sulphate or nickel, but states that operations have been extended, thus making it possible to maintain profits in spite of the low price of copper. The consumption of nickel is increasing, especially for use in making nickel steel for bridge building and other structural work. The report also records that the hydro-electric plant, on the Vermilion river, is completed, and is supplying power to the mine and smelter. This plant is owned and operated by a subsidiary local company in order to comply with Canadian charter. Some current is sold to outside customers, and additional profits will accrue to the nickel company. The directors refer with regret to the decease of Ludwig Mond, by whose unremitting application, the company was brought to a success. We should like here also to record the valuable services given to the company and Mr. Mond by Carl Langer, the metallurgical engineer at Clydach.

The Waihi Grand Junction company was formed in 1895, to acquire property to the west of the Waihi gold mine. Three of the Waihi lodes are found in the Grand Junction mine, namely, the Martha, Royal, and Empire. For many years prospecting and development gave disappointing results, and large amounts of capital have been expended. Milling eventually commenced in 1906, with 40 stamps bought from the Kauri company, and 4 tube-mills and cyanide plant were added. More recently 60 new and heavier stamps, and 6 tube-mills were purchased, but have not yet been erected. F. C. Brown, known in connection with agitator-vats and tube-mill lining, was, until the end of 1909, the general manager, when he was succeeded by W. F. Grace, who had shortly before been sent out to examine, on behalf of people who had provided further funds for working capital. The report for 1909 was published last month, but by far the most interesting and important information relates to the period since the close of the year, for the underground development, conducted under Mr. Grace's directions, have been both energetic and successful. At the meeting of shareholders, the recent discoveries were given in detail, from which it would appear that the Royal lode promises to become an important producer. The Empire lode is developing in a satisfactory way, and a new lode, christened the George, has been found. The yield has been continually improving and the costs decreasing, so that the results during the first five months of this year are an improvement on those of a year ago. As regards the results for 1909, it is reported that the general conditions improved greatly as the year went on, so that a profit was made in spite of the gloomy results published in the half-yearly report issued during the summer. The mill treated 59,147 short tons, yielding bullion worth £100,687 or 39s. 5d. per ton. Mining cost £37,045, extraction £24,489, development redemption £11,829, administration in New Zealand £6306, in London £3256, depreciation £7279, gold duty and realization expenses £4220; there were other small items, and the balance of profit was £5729. This result is encouraging, after so many years' expenditure and debits. For the first five months of 1909, the ore treated was 28,952 tons, and the yield was worth £44,822. Mr. Grace does not propose at present to erect the 60 new stamps, but has added two of the tube-mills to the plant, and finds that the installation can treat 400 tons per day. He has also improved the extraction, by installing a system for keeping the circulating cyanide solutions clean. No mercury is used in the stamps, and the ore is 'all-slimed'; recently the extraction fell away and Mr. Grace examined the cyanide circuit and detected the weak point. By means of the improvements introduced, the extraction is improved and the consumption of cyanide decreased. During the past year the capital was increased by the issue of 70,000 new shares, which were taken by shareholders at par, with rights to subscribe to 35,000 other shares at 30s. each; by this means the debt of £60,000, raised by loan, has been discharged, and an ample supply of working capital provided.

For some time the shares of the Great Fitzroy copper mine at Mount Chalmers, Queensland, have been depressed,

much to the mystification of the shareholders and public who had previously been impressed by the excellent reports of great bodies of copper ore. That something was wrong was evident, though no statement was published. A note has now been issued by Hewitt, Moreing & Co. the managers announcing that W. J. Loring has advised an alteration in the plans. It appears that water concentration has been unsatisfactory, and that the results expected and indeed claimed by the superintendent have not been obtained. Accordingly the concentration mill has been closed and all efforts are being centred on pushing forward the construction of the flotation plant and sintering furnaces. In the meantime only one sintering furnace is in operation, working on crude ore. The company announces that the flotation process owned by the Minerals Separation, Ltd., is to be adopted. This process is the invention of Sulman Picard and Ballot and has been in operation for some years at the Sulphide Corporation's mine at Broken Hill. Three years ago it was tried by the Zinc Corporation at the same centre, but it did not give good results there. Since then the mechanical details have been worked out by Theodore J. Hoover, whose practical and theoretical skill as an engineer, has been of the greatest possible value. Some of the shareholders of Great Fitzroy have been grumbling about the adoption of this process, and point to its failure at the Zinc Corporation, but they ought to know that the process has advanced a long way since those days. They also object, because the litigation is still going on in Australia, between the Minerals Separation and the Elmores. My point of view is that its adoption in this case may bring about the long desired pacification of the rival flotation patentees, either by an amalgamation of interests or by a mutual agreement to cease firing.

KALGOORLIE, WESTERN AUSTRALIA

Diamond-Drill Results in Kalgurli — Chamber of Mines. — Government Work.—Water Supply.—Perseverance Installation.

During May the gold mines in the State produced gold valued at $2,715,000, and paid dividends totaling $63,500. The principal mines returned the following:

Name	Tonnage.	Yield.	Profit.	Dividend.
Associated	12,004	$73,000	$750	.....
Asso. Northern Blocks	2,036	15,000	5,500	.....
Chaffers	4,340	31,000	1,100	.....
Golden Horseshoe	24,690	198,000	34,000	$375,000‡
Golden Ridge	2,355	32,000	14,000	.....
Great Boulder	18,490	246,000	125,000	.....
Great Fingall	10,753	76,000	11,500	62,500‡
Hainault	5,913	40,000	7,500	18,500‡
Ivanhoe	19,635	204,000	100,000	450,000‡
Kalgurli	10,890	141,000	73,000	185,000‡
Lake View & Star	11,608	67,000	2,100†	.....
Lake View Consols	9,980*	9,000	2,500	.....
Oroya-Brownhill	21,084*	27,000	14,500	.....
Oroya-Black Range	4,500	45,000	11,500	.....
Oroya-Links	11,480	75,000	17,000	.....
Sons of Gwalia	13,510	115,000	52,000	.....
Sons of Gwalia South	2,452	23,000	6,700	.....
South Kalgurli	9,350	62,000	14,000	50,000

*From residue treatment. †Loss. ‡April.

At 1550 ft. in the Kalgurli, the diamond-drill cut 58 ft. of ore, worth $25 per ton, 19 ft. of this being high grade, and in a week or two the cross-cut will have intersected the lode. The Kalgurli has always been noted for its wide lodes, which are of no great length, but persist in depth. Acting on the advice of Malcolm Maclaren, geologist for the Ivanhoe, the company has started drilling west from 2000-ft. depth, in one of the Horseshoe shafts, known as the Ivanhoe South Extended. It is argued that there may be a parallel series of lodes to those in the Ivanhoe and Horseshoe on this side. The old Ivanhoe Junction, recently bought by the Ivanhoe, worked a lode west of the latter, but results were not payable, although work was only carried on in a half-hearted manner, with a wretched plant. It is to be hoped that this drilling will prove an extension of the Golden Mile laterally.

The Chamber of Mines after much consideration has made suggestions to the Minister of Mines that the Government should send out geologists to examine the country between known fields and so connect them and issue reports which would be of value to prospectors and others such as is done in the United States and elsewhere. Also that parties of prospectors should be sent out searching for new fields. The Chamber pointed out that Western Australia had very little spent on it geologically when compared with other countries. The Minister is in favor of the first proposal, but would not promise anything in connection with the latter just yet. Parties have been aided from time to time, but results have not been satisfactory. The expense of the geological surveys asked for will not cost more than $2,000 in two years, a trifling sum to aid a decreasing industry that in less than twenty years has produced about $175,000,000, paying $15,000,000 in wages, besides other large amounts for stores and which supplies two-thirds of the value of all exports from the State.

Word comes by telegram from the boring party at work on the Trans-Australian railroad, that a good supply of fresh water had been cut at depth of 1290 ft., not far from the Great Australian Bight. This is of great importance to the proposed line, as the sum of $3,000,000 is set down for the cost of a water supply. Mr. Maitland, geologist of the Government Survey, has always been of the opinion that there is a basin in this district. The commission on phthisis among miners is still taking evidence and examining certain cases. There have been many cases of bronchitis, but few were associated with fibrosis in the Murchison field. Men who had a cough, took a fortnight's rest and recovered; but when they returned to work it reappeared. This was only bronchitis, and not tuberculosis. It may be remembered that the Government sued the Golden Horseshoe for some $21,000, for dividend duty not paid, and the company lost the case. It then went to the Full Court, which upheld the decision, so now a final appeal is to be made to the Privy Council. If the company loses before this tribunal, the dividend paying mines will have to pay up over $150,000.

During the month the Kalgoorlie mines consumed 34,172,000 gal. of water. The corrosion of the main conduit is causing much investigation, and it is proposed to erect a station near the reservoir, 353 miles away, to add 5 grains of CaO per gallon to prevent this; also, to erect suitable regulating tanks which would relieve the pumps of some of their work. The English experts consulted, reckoned that air should be prevented from entering the main, but the efficacy of this is doubtful and the cost high. Mr. Mann, Inspector of Explosives, argues that oxygen is not the cause of corrosion, but hydrogen. The water is very corrosive in the main pipes, but it does not affect boilers on the mines, although where hot water is in circulation in the mills the pipes last under 12 months. It would seem that wood pipes would solve the difficulty, after the steel main has had its day, although 353 miles of 25 to 30-in. wood pipe is a big order.

The Associated has just erected two No. 8 Krupp ball-mills, and these would operate to perfection as dry crushing machines. They cost some $4000 each, and running at 21 r.p.m., loaded with 4400 lb. of steel balls, and crushing a hard ore through a 30-mesh screen, at the rate of 92 tons each per day, consume only 50 hp., with milling costs 50c. per ton. The No. 5 size is very useful in a small plant, and crushes about 43 tons per day through 25 mesh. At the Ivanhoe experiments have been made on the residue dump by the vacuum process; but results are not public yet. The engineer on the mine has invented another type of slime-filter. To relieve the hoist at the main shaft, a Fraser & Chalmers single drum, Corliss gear hoist is just about ready for work in the third compartment of this shaft. The Great Boulder and Horseshoe have hoists on their third compartments also, as well as working other

shafts. Twenty head of new stamps have been erected at the old mill at the Horseshoe, and remodeling of the other 50 is in progress. At the new mill of 100 head, extra tube-mills are being installed.

All is bustle at the Perseverance; the main hoist is being overhauled; one 30-drill Walker compressor is complete, while the second one has just arrived; the ball-mills, motors for driving same, and furnace alterations, are finished. Two tube-mills and ore conveyor are well under way. By the time these notes reach America the new mill should be in full swing. The officials concerned must be complimented on the excellent work done. Underground, everything is in readiness, and probably 22,000 tons per month, will be dealt with.

BUTTE, MONTANA

Butte & Superior.—Heinze Holdings.—Output for July. — Reins Copper Co. Suit.—Raven Assessment.

A. M. Chisholm, a heavy stockholder of the Butte & Superior, has returned to Duluth after having spent several days in the city looking over the property and interviewing stockholders, as to the best means of handling the property. Mr. Chisholm is a strong opponent of the refinancing scheme as recently adopted at a special meeting of the stockholders. He says that money could be secured through some zinc concern instead of issuing bonds. Although the Butte & Superior is pronounced by many mining men as the best zinc property in America today, it is heavily in debt, and has current debts to the amount of $400,000, one-half of which is due within 30 days. Where the money has gone many stockholders would like to know, but it is apparent from a statement recently made, that at least a portion of the money has been lost through bad management in operating. For instance, during the month of June, some 9000 tons of ore were mined, on which there was a loss of about $12,000, according to reliable reports. A metallurgist made an examination of the operations at the Basin concentrator, and reported that 55% of the mineral value has been lost in the tailing. Mr. Chisholm finds fault with the management in borrowing $250,000 from the American Metal company for the purpose of building a concentrator. The only work toward the building was the grading for the foundation, and the purchase of some of the structural steel, while the money has all been expended.

The Davis-Daly tramway from the Colorado mine to the Northern Pacific tracks, is ready for operation, but it is not known when any ore shipments will be made to the Basin concentrator. Development on a small scale is going on in the Colorado mine on the 1400 and 1800-ft. levels, and the cross-cut from the 1400-ft. level to the Hesperus, is being extended. If all reports are true F. A. Heinze is going to make some money out of his Stewart mine, in the Coeur d'Alene district. Over 200 tons of ore per day are being shipped to the smelter, making a profit of $500. In sinking a new shaft in the mine an orebody, which completely filled the opening, was discovered. The Butte-Ballaklava dividend of 50c. is being received this week, and some of the stockholders of the company are so jubilant over reports they have received, that they are predicting a dollar dividend within six months. The company at the present time is shipping 225 tons of ore per day.

According to the statements of Anaconda officials, the smelters at Anaconda and Great Falls are running to their full capacity on ore from the mines in this city, although there is no doubt that the number of men underground has been reduced, and that the quantity of ore being hoisted is much less than it was two or even one month ago. The miners' union officials are making the assertion that over 2000 men have been laid off, and that there is a reduction of about 3000 tons of ore per day. The reduction included the independent mines, such as the Tuolumne, Butte-Ballaklava, and East Butte. The Parrot has not been in operation for a long time, neither has the Rarus of the Butte Coalition company, or the Neversweat of the Anaconda group. Basing their opinion on general conditions and reports from the East, mining men believe that there will be a curtailment in this district of 25% in accordance with an understanding said to have been reached by all the big producers. The estimated ore tonnage and copper production by the different companies, in July, were as follows:

	Daily. Ore, tons	Month. Copper, lb.
Boston & Montana	3200	6,800,000
Anaconda	4400	7,900,000
Butte Coalition	1450	3,000,000
North Butte	1100	1,950,000
Original	500	1,100,000
Butte & Boston	550	950,000
Trenton	450	830,000
Washoe	450	725,000
Butte Ballaklava	150	675,000
Tuolumne	100	275,000
East Butte	200	270,000
Parrot	150	260,000
Miscellaneous	50	120,000
Totals	12,750	24,855,000

John P. Reins, of the Reins Copper company, has commenced a suit against the company to recover on a promissory note for $20,000, on three assigned claims for services to the company. The note was executed at Pittsburg, April 28, 1908, by W. F. Johnson, treasurer of the company, and bears interest at the rate of 5% per annum. The assigned claims are as follows: G. L. Thompson, $736; R. S. Wilson, $717.50; H. C. Dahl, $833. The total amount claimed to be due, with interest, is $24,878.07. The Raven company assessment of 10c. per share, which was ordered a short time ago, is due and payable at the office of the International Trust company, Boston, August 15. By this assessment the company expects to receive enough money to pay off the bonded indebtedness, leave the property entirely free of debt, and to have a balance sufficient to carry on development for nearly a year. The shaft of the Raven has been sunk to a depth of 1500 ft., but it is stated that owing to the great inflow of water, little driving has been done, and cannot be until pumps are installed. In ordering the assessment the directors state that owing to the condition of the money market it was found impossible to renew or extend the mortgage bonds, so it was necessary for the company to take from its treasury the funds it had intended for use for development, and pay the bonds as they fell due. It is stated that the ore so far found in the shaft, it not of a quality to warrant mining, but it is hoped to find good bodies of ore as soon as driving can be done.

LOS ANGELES, CALIFORNIA

Southwestern Iron.—Skidoo Mine.—Pinmore.—The Oil Industry.

During the past week there have been persistent rumors, although no definite information, regarding the construction of a large blast-furnace and steel plant at Long Beach. Details are lacking, but it is stated that representatives of Harriman interests have spent several days in consultation with owners of large tracts of land near Long Beach. About two years ago the extensive holdings of L. S. Barnes, in Riverside county, comprising many acres of iron land, were purchased by Harriman interests; since then rumors have from time to time been heard regarding the construction of a steel plant. Judging from present activities it would seem that something definite is afoot, and information of interest is promised on the return of Mr. Barnes from the East. It is stated also that a foreign corporation intends to erect a plant on the coast, using oil as fuel. Whether or not anything materializes from these rumors, it is a certainty that valuable iron lands are to be found within comparatively short distances from the coast, and that there is a market here for the products of an iron and steel plant. The construction of such a plant would doubtless result in a saving to the consumer here, and a corresponding loss to the railroads that now receive the benefit of the long haul from Eastern points.

The Skidoo Mines Co., operating in the Panamint range,

Inyo county has just received word from the home of a discovery of a new orebody four to six feet wide and running about $20 per ton in gold. It is estimated that there is probably $100,000 worth of ore in this new body. The company has recently passed the zone of the dividend payers discovering it but $5,000 as its second dividend. The mill is treating about 1,200 tons of $12 to $14 ore per month, and the monthly profit averages $5,000. Work is to be discontinued on the Piumore mine at Johannesburg on 01 September. It is the intention of the operators on resuming operations to rebuild and put in operation five of the ten stamps of the mill that was destroyed by fire some time ago. Work for the past year has been devoted chiefly to developing two veins on the 100 and 200 ft. level, and it is stated that sufficient ore has been developed to supply five stamps for more than a year.

The great Lakeview gusher in the Midway field, Kern county, is said to have decreased to a flow of 22,000 to 28,000 bbl. per day during the past week, as compared with 25,000 to 30,000 bbl. during the previous week. The American Oilfields has brought in a gusher just west of the Lakeview. The initial flow was estimated at 25,000 to 30,000 bbl. per day and the last reports were that the well shoots oil 25 or 30 ft. above the crown block whenever the gate is opened. The hot weather seems to have had little effect in decreasing activity in the Kern River country. The State Oil Co., Kern River Driller Oil Co., and the Bardole Oil Co., all under one management, are opening new ground. A rig is in place for well No. 1 of the State company, and material is on the ground for wells No. 2 and 3. Three wells are pumping on the property of the Kern River Driller Co. and a rig is up for the fourth well. Well No. 1 of the Bardole company is down 600 ft. The gusher of the Mays Oil Co. has decreased to a steady flow of 2000 bbl. per day and is said to be one of the best wells of the west side field. This company is drilling for another gusher. On the Green & Whittier lease, owned by the Associated Oil Co., about 150 men are employed. New boiler houses are being constructed and the foundations are laid for several tanks. The old pipe line that carried oil to the Standard Oil Co.'s tanks is being taken up, a new line, two miles of which has been completed, is to be laid. Drillers are at work on one or two of the old wells and material is being hauled in for new wells. The C. C. Midway Oil Co., operating on ground owned by the Santa Fe railroad, is drilling a number of wells and putting up buildings for men and stock. There are five wells in operation on the property of the United Oil Co. at Fellows; three strings of tools are being laid with which to drill additional wells. The Hawaiian Oil Co. is drilling two wells by the rotary process near Fellows and is said to be making good headway. The Lucks Oil Co. is drilling several new wells at the north end of the field. Several storage tanks with cement foundations have been erected. Material is being hauled to the lease of the Alma Oil Co. and preparations are being made to put down eight new wells.

In the Coalinga district the Silver Tip Oil Co. is expecting great things of well No. 2. During operations at the well last week, in the same formation as that cut in the No. 1 gusher, a sudden spouting of oil occurred, and for some time the fluid shot high above the derrick. This subsided after a few hours, however, owing to the sanding of the hole. The Creme Petroleum Co. has made a depth of about 2000 ft. on its well. A rotary drill is being used with good effect. The British Consolidated Oil Co. has acquired the Wabash property and is about to begin new development. There are now 17 producing wells on this property. A large force of men is busy constructing the necessary buildings at the camp of the Medallion Oil Co., operating in the Kettleman Hills district. It is expected that active drilling operations will be started by September 1.

Plans for the meeting of the American Mining Congress, September 26 to October 1, are being pushed. J. F. Callbreath, secretary, has been here in conference with the local committee. Public land problems are to form the main topic of discussion at the meeting.

NEW YORK

Effects of Liquidation — Copper Curtailment — Utah Copper Co. — Greene Consolidated — Nevada Hills — Mexican Development — Porcupine.

In the panic of 1907, some of the New York bankers came to the rescue of the market and to the rescue of some of the corporations, at the time badly battered by the storm and far drifting on, to a lee shore. At that time there was a great deal said about the courage and the trustworthiness of these saviors of the situation; these landmarks in time of stress; oddly enough there was little or nothing said of the salvage claimed by the rescuing parties. Surely the towing lines were sent out to disabled craft but just as surely as such craft were towed into calm waters, they sailed forth again under the colors of the rescuers and not those of the former owners. No one would say that the boys' rule of finding is keeping is a cardinal principle of high finance, yet there were some happenings this week that if one had the temerity to suggest it, might appropriately be held within the rule. During the latter part of last year, a group of English and Canadian financiers, headed by F. S. Pearson, an engineer of high repute, an American by birth, but for a long time a resident of London, became heavily interested in the Rock Island railroad. The coterie of capitalists so engaged were known to be railroad men of ability, among their enterprises being the Mexican Light & Power Co., and the Mexican Tramways Co., the two concerns holding a practical monopoly of the public utilities of the City of Mexico, and the former being engaged in the construction of hydro-electric plants throughout the Republic of Mexico. The activities of Sir Weetman Pearson of the great English contracting firm, in the oil business in Mexico, served to confuse the two in the minds of the public. Of the same name, the two are not connected in any way. The Pearson syndicate evidently nursed some very ambitious plans, some whose scope were far too wide to please some of the financial powers of New York. For the past six weeks or longer, it has been a matter of comment that there seemed to be an utter absence of inside support for a market, in which continued liquidation was becoming painful. It now appears that this recent course of the market was permitted to allow the Pearson syndicate to drift far enough toward the breakers to get beyond the point of haggling about the amount of salvage. This week saw the crisis, saw a market breaking five, ten, fifteen, in some cases, thirty points. The general Wall Street public was simply picking up the miscellany on its desk and, aimlessly and nervously, turning them over and putting them down in the same place, talking crop scare, copper weakness, and too many automobiles, while the real factors watched the Pearson syndicate try to unload under peremptory calls for margins. The storm promised to scatter wreckage all along the financial coast line, when Kuhn, Loeb & Co., and the Drexel-Morgan banking interests, steamed in and steamed out again with the materials for a new trans-continental railway, courteously taking the cargo of the syndicate as salvage. In 1907, when a very important New York Trust company found that the controlling interest in Tennessee Coal & Iron was more than it could carry and panic conditions became acute, it was Mr. Morgan who saved the day and in doing so saved Tennessee Coal & Iron for his U. S. Steel Corporation. With Mr. Pearson in various enterprises are associated Sir William Van Horne, of the Canadian Pacific, William and Alexander Mackenzie, both also of Toronto, Jose y Limantour, the Mexican Minister of Finance; Enrique Creel, Governor of Chihuahua, and others. The plan of the present operation contemplated a trans-continental railway system through a control of Rock Island, Lehigh Valley, Missouri Pacific, Denver & Rio Grande, Wabash, and Western Pacific, the whole to be operated in conjunction with a Mexican railway system to be joined to the Denver & Rio Grande. The something which has been hanging over the market was the burden of these operators; that the banking interests have been waiting for the opportunity, which has just come to them, goes without saying. A distinctly better tone now prevails, but the

question 'is findin's keepin's?' remains unanswered save by demonstration.

Next to the near panic, the important feature of the day is the determination to curtail copper production. Statements by the participants in the conferences of the producers held in London are comically cryptic. There are to be no admissions made that smack of conspiracy. John D. Ryan, president of the Amalgamated, and the acknowledged diplomat of copperdom, said, in a recent interview, "The representatives of many of the leading copper interests have been conferring in London, and the result is a better understanding among them regarding the copper situation. In fact, I may say there is a very general understanding among copper producers regarding the future output of copper." If that be treason make the most of it. What the effect of copper curtailment is to be is hard to conjecture. A 15c. copper, if maintained for any length of time, will stimulate production by smaller producers, now developing, who are no parties to any agreement, admitted or denied. Just how the present powers that be, are to maintain the price without creating numberless effective competitors, is one of the problems. The really effective weapons for complete control of the copper industry are the smelters and the selling agencies, these are in the hands of the Guggenheims and the Amalgamated principally, and if these are to be included in the understanding mentioned by Mr. Ryan, then curtailment may be made more effective than might at first glance seem possible.

The report of the Utah Copper Co. for the quarter ended July 30, has just been sent to press. The figures are interesting, as this is probably the last quarter, which will show record-breaking production for some months to come. The output was 25,124,052 lb. as against 18,511,619 for the quarter preceding and 13,291,210 for the quarter ended December 31, 1909. Earnings from the operation of the Utah Copper alone for the quarter were $1,192,551; dividends from Nevada Consolidated holdings, $356,428; dividend requirements were $1,149,616, leaving a surplus for the quarter of $399,363. The figures given will be interesting by way of comparison with those of the coming quarter in order to estimate the proposed curtailment of copper production. A 15% cut in output is to go into effect in Utah Copper and Nevada Consolidated; the latter now holds its place as producing the cheapest copper in the country. Nevada Consolidated's output for the quarter ended June 30, was 18,173,676 lb., produced from ore averaging 2% copper. The cost per pound for the quarter, after writing off $132,902 for depreciation of the Steptoe smelting plant, was 6.34c. as against 7.89c. for the preceding quarter. Net earnings for the quarter were, after paying interest on outstanding bonds and writing off depreciation, $1,147,796. Dividend requirements $746,479, leaving a surplus of $401,317.

The thawing out process was begun at the new smelter of the International Smelting & Refining Co., at Tooele, by William Spry, Governor of Utah, who went down from Salt Lake for the express purpose of striking the first match to light the fires. It will take about three weeks to get the first reverberatory furnace and the stack warmed up to a point where actual smelting operations can begin. The delivery of Utah Consolidated ores has been delayed by reason of the breaking down of the tramway and, in the meantime, shipments are to be made by rail, so that the ore-bins may be filled ready to feed the furnace by September 1, by which date shipments from the Giroux are expected to be going forward regularly to the smelter also. The ores of the Giroux will have to be carried for 150 miles over the Nevada Northern railway, which is controlled by the Guggenheims; contract for this transportation has not been arranged yet, but it is not anticipated that there will be any difficulty in making an agreement. The amount of the ore reserves of the Giroux and the copper content thereof are not known, outside of official circles. Whether or not Giroux can produce copper at a profit on the present metal market is not known.

Adrian H. Joline, one of the leading members of the New York bar, has handed down an opinion as referee, in favor of the Greene Consolidated Copper Co., in a suit brought by the minority stockholders of the Cobre Grande Copper Co. of Arizona. This suit and two other similar suits were brought against the Greene Consolidated to recover certain properties and compel an accounting, under a claim that William C. Greene wrongfully deprived the Cobre Grande of the mines in controversy, in 1899, when Greene took possession of same and later turned them over to the Greene Consolidated Copper Co. The Yampa smelter at Bingham, Utah, is to be closed and the ores of the Tintic Mining & Development Co., and some of the ores of the United States Mining Co., amounting to about 800 tons per day, will be sent to the Garfield smelter in place of that previously shipped by the Utah Consolidated.

The ores of the Nevada Hills have been proved by tests to be so nearly identical with those of the Montana Tonopah, at Tonopah, that the method of treatment in operation at the latter property is to be adopted without change by the Nevada Hills' management. The East is taking a great interest in Nevada Hills in the hope that it is to prove a strong active market issue like Goldfield Consolidated. The expected deal in Florence failed to materialize and instead there has developed a small market manipulation in Jumbo Extension. The Eastern market looks upon the reported elimination of T. G. Lockhart from the active management of the Florence, and the election of A. D. Parker as president, with much favor. It has always appeared to the Eastern investor that Mr. Lockhart has been an obstacle in the way of broad-minded progressive development of the Florence.

There are some particularly favorable mine developments noted recently at Guanajuato. In the Tajo de Dolores mine, controlled by the Proprietary Mines Co. of America, five feet of ore has been opened in the west drift on the San Eusebio vein on the fifth level, which averages $67 per ton. This is bonanza ore and means a great deal for the property and for the camp at Guanajuato. The mill on the Dolores is being pushed to completion, 60 tons per week of freight going from the railroad station to the mine. The mill is expected to be in operation in December. The Pinguico Mines Co., controlled by the Securities Corporation, reports the opening of an entirely new orebody on the eighth level, and which has since been developed on the ninth and tenth levels, a great deal of which is rich enough to go direct to the smelter without treatment at the mill. Several cars have been shipped running $10,000 and $12,000 per car. The Oro Grande Mines Co., recently organized by the Securities Corporation, as one of its subsidiaries, is paying a semi-annual dividend of 3% on its preferred stock. This company acquired the mill and the ground of the Guanajuato Amalgamated Mines Co., known as the Adams property. When this concern was taken over it was appraised on the value of the milling plant alone. Exploratory work in the mine has since developed a considerable body of milling ore, which will aid materially in furnishing a satisfactory tonnage to the mill. The increased price for silver and the improved tone in the silver market has given new courage to the operators at Guanajuato, and has perceptibly increased the interest in Mexican enterprises throughout the East. The industrial development of Mexico is being watched with increasing interest. The transportation question is recognized as being of as great importance as the development of the various mining camps, and the work of building roads and the installation of hydro-electric power plants, will greatly stimulate the mining industry. Richard Honey, the iron manufacturer of Pachuca, who is building the Pachuca & Zimapan railroad, has recently been granted a concession to build a railroad from Pachuca to Mazatlan, and is preparing to start work on the new road.

The five-stamp mill on the Timmins property at Porcupine, is continuing to show encouraging results. A 30-stamp mill has been ordered by the Timmins syndicate, and the belief seems to be growing in the permanence of the camp. A standard-gauge road is to be built from a point on the Temiskaming & North Ontario railway to the Metagami river, a distance of about forty-two miles.

General Mining News

ALASKA

(Special Correspondence.) That the Iditarod is a rich camp, though at present handicapped by crude methods and lack of capital, is the conclusion of first authoritative reports just received here direct from the newest gold region of Alaska. The clearest and most hopeful statement of conditions was made by Herbert L. Jaffe of Seattle, in reports to M. Robert Guggenheim, whom he represents. Mr. Jaffe says there is much excitement but little money in the camp. Prices are high for everything. Wood is $40 per cord, bacon 75c per lb., and meals $1.50 to $3 each. Nevertheless, he says, the gold is there, and plenty of it. He estimates that five or six of the eight creeks will yield from $5,000,000 to $6,000,000 each, a probable total of $35,000,000 to $40,000,000. Mr. Jaffe strongly favors the district for dredging operations, like those at Nome. He says the ground can be handled for not more than 30c per cu. yd., while operations so far prove that the pay is from 75c. to $5 per cu. yd. Some rich ground has been found, and there are instances of pans of gravel running $30 and even $40. Bob Martin, a well known Alaskan, sold one of his claims on Black Creek for $5000, and the new owners a few days later made a preliminary clean up of $2800. Bedrock is seldom more than 20 ft. down, and the pay-streak varies from one to seven feet in thickness. Operation is possible both winter and summer.

Seattle, July 30.

ARIZONA

COCHISE COUNTY

A tank has been placed at the 1385-ft. point in the pump compartment of the shaft, at the Denn Arizona, to catch the water above that level. A 100-gal. pump is used in sinking the shaft, which is going down at the rate of 15 ft. per week.——In the Dragoon district, which has been largely prospected for copper ore, Oliver Merrill has cut a 10-ft. vein at a depth of 70 ft., that assays $8 per ton gold. Drifts are being driven on the shoot, and a winze sunk in the ore.——A rich discovery is reported on the claims of Cummings & Wolcott, in the Courtland district, and 35 sacks of the ore have been shipped to the smelter at Douglas, to determine its value.—— The Texas Arizona Mining Co. has ordered a consignment of new machinery, which will be installed at the mine, northeast of Dragoon, in a short time. The ore is principally a silver sulphide, though some lead and gold have been found at places in the shoot.——New equipment has been forwarded to the Bisbee Coalition Mining Co., which is a consolidation of the North Bisbee and the Eureka Mining companies, in the Warren district. There is over 1000 ft. of development on the ground from which several lots of 17% copper ore have been shipped.

GILA COUNTY

(Special Correspondence).--The McGaw shaft on the property of the Superior & Boston Copper Co. is at a present depth of 761 ft. from the collar or 210 ft. from the sixth level. The stopes from which most of the ore is coming at present, are on the sixth level, about 320 ft. west of the shaft. Little or no timber is used, and with the exception of one man at the central chutes, no handling of the ore is necessary.——With the exception of the curtailment of development, things at Miami are progressing as usual. It has been definitely decided to use Deister No. 2 and No. 3 tables in the mill, exclusively, and the Nordberg hoists at the main shaft are being installed.——At the property of the Lost Gulch United Mines Co., the three lodes, Tiger, Badger, and Bonanza, are being exploited. The drift on the Tiger is in gold ore assaying about $30 per ton. The adit to open the Badger and Bonanza lodes is ultimately to be 1200 ft. long, and is now 1100 ft. from the portal.

Globe, July 29.

MOHAVE COUNTY

Another rich discovery was made at the Tom Reed mine in the San Francisco district a few days ago when a 5-ft. shoot of high grade ore was opened on the 300-ft. level, about 800 ft. from the main shaft in the western portion of the mine. The foundation for another battery of 10 stamps is completed and a new tube-mill and compressor have been installed.——A second consignment of $150 ore has been forwarded from the C. O. D. mine and a new Cameron sinking pump placed in the shaft.——The Arizona Turquoise Co., which has a bond on the IXL. mine, has taken a hoist to the property and is cleaning out the old shaft.——Work at the Cyclopic is progressing rapidly, and the main shaft is expected to reach the 300-ft. point in a short time.

NAVAPAI COUNTY

The Mount Elliot Consolidated Mining Co., of Chaparral, recently shipped a $3250 bar from the last clean up, and approximately $4000 worth of concentrate. The company has just completed the installation of a 5-drill compressor, and the electrification of the entire plant.

YUMA COUNTY

(Special Correspondence.)—There is little activity in the immediate vicinity of Bouse, at this time, although several companies are preparing to resume operations in September. The Mudersbaugh property, consisting of 34 claims, lying about eight miles south of Bouse, has been purchased by George Mitchell, of Los Angeles. It is said that men are now on the ground to begin development.——The Little Butte Consolidated and the Pay Car Mines Co. expect to resume operations in September. The former will construct a mill in the fall. The property of these companies lies just to the west of Bouse. J. C. Denton, who will have charge of work for the Pay Car company, has recently purchased the Sunshine and Free Gold groups, comprising 11 claims, lying four miles west of Bouse. These have been turned over to the Pay Car company, bringing that company's holdings up to 65 claims.——Finney & Brooks, of Los Angeles, have begun work on a gold prospect about twenty miles north of Aztec. Down to the present depth of the shaft, 50 ft., ore carrying $16 per ton in gold has been developed. The ore occurs in a wide zone of silicified rhyolite. It is purposed to sink the shaft to a depth of 100 ft., and determine by cross cuts the width and tenor of the orebody at this depth. Two shifts are at work.

Bouse, August 1.

CALIFORNIA

AMADOR COUNTY

The drift on the 1200-ft. level of the Central Eureka, near Sutter Creek, is reported to have opened a 10-in. shoot of high grade ore 150 ft. from the shaft.—The machinery for the erection of a 4-stamp mill is being hauled from Martell to the Whitmore mine, near Volcano, and the property will be thoroughly prospected. There is considerable ore on the dump that will be run through the mill at once.

INYO COUNTY

During June, the Tecopa Consolidated Mining Co., in the eastern part of the county, shipped 116 carloads of $16 ore to the smelters. Of this 70 cars went to the American Smelting & Refining plant, at Salt Lake, and 46 to the Needles smelter.

NEVADA COUNTY

The new concentrator building, at the Erie mine near Graniteville, will be completed in a short time, and the concentrators installed. It is thought that this will make a considerable saving as the ore contains a large amount of pyrite.—John Langman, Frank Bishop, and associates, of Nevada City, have located 160 acres of gravel land at You Bet, and will attempt to re-work the ground that proved so rich in the early days of that district, when hydraulic operations were permitted.——New machinery is being installed at the old Wisconsin mine in the Graniteville district, and the shaft, which is reported to be 150 ft. deep, will be unwatered. Fred Medlin is manager.

SHASTA COUNTY

Though the closing of the Bully Hill smelter, at Winthrop, has thrown a large number of men out of work, there are over 100 employed in the Bully Hill and Rising Star mines, the company shipping about 100 tons per day to the Mammoth smelter.——After a two weeks' continuous run, the Heroult iron smelter, on Pit river, has closed down, and five additional furnaces will be erected. The Northern California Power Co., which furnishes electricity to the

Heroult Smelter in Course of Construction.

smelter, will have the plant near Ball's ferry completed this fall, making 20,000 hp. available. A carload of the pig iron produced in the last run, has been shipped to the Columbia Steel Co., at Portland, Oregon.

SIERRA COUNTY

Fred H. Pearson has obtained a bond on the Independence mine, on Wolf creek, and will unwater the shaft, which is down 180 ft. The ore in the upper level is reported to be high grade.——Richard Phelan, of Sierra City, is having the assessment work on his claims in Slug canyon completed for the year.——Curtis Lochlin, of Nevada City, examined the Empire mine, in Gold valley, for Eastern capitalists. The property is equipped with an electric plant, hoist, and mill, though it has been idle for the past two years.——Adam Kieffer has repaired the gasoline engine at the Gilbraltar shaft, and two shifts will be started unwatering the ground. When this is completed the drift will be driven under the channel.

TRINITY COUNTY

At the Oversight mine, owned by A. H. Wolf, and associates, on the Yellow Jacket creek, a branch of the east fork of the Trinity river, some high-grade free-milling ore has been taken out recently. In the same district is the Alaska mine, and the Yellow Jacket, owned by R. L. Carter, Jesse Turtelotte, and L. H. Boyd, of Weaverville. Though only a small amount of development has been carried forward on this claim, several stringers of high-grade ore have been opened.——On Rattlesnake creek Armstrong & Liebbrandt, of Santa Cruz, have a good prospect. They are now treating a free-milling ore, with considerable galena, in a 5-stamp mill. King & Bailiss, who have a group of placer claims in the same district, have just cleaned up, as the water is getting too low for operation.——The great La Grange placer mine is also short of water, and the reservoir has to be allowed to fill before piping. The ground caves at the working face in such quantities that it is seldom necessary to move a giant more than once a year. Much fine gold escapes, but the La Grange company owns the valley of the north fork, and will not allow anyone to attempt to work the tailing.

TUOLUMNE COUNTY

(Special Correspondence).—The mill at the Donella, near Arastraville, began crushing ore last week. The quantity if ore in readiness is estimated at 400 tons, and, it is said, will average well in free gold. Development is being continued and the outlook is good.——The working force at the Jumper is being increased as fast as additional men can be employed advantageously. It is understood the company contemplates many changes, with a view to economy in the working of the mine and the reduction of the ore.

Tuolumne, July 30.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence).—Advices received from Boston are to the effect that the Kelley property, on Democrat mountain, has been sold to Mr. Millikin, a mining engineer of New York, for a consideration of $380,000. It is understood that work will at once be put under way in the advance of the adit which is in 2800 ft. The 50-ton mill will be remodeled and enlarged to treat 150 tons per day. The property was owned by H. O. Marcey of Boston.——A deal has been closed whereby C. D. Runkle and C. W. Draper secure the Colorado Central group of mines, under bond and lease. A force of six men has been put to work, and as fast as the workings have been placed in shape, more miners will be given employment. Drifts have been started on the Equator vein through the Marshall adit, a body of rosin zinc being followed that is from 3 to 7 ft. wide. The bond runs until December 1.——M. Bonheim & Son report that a 3-in. streak of ore has been uncovered in the south drift on the North Star vein, East Argentine district. Assays run 6 oz. gold and 973 oz. silver per ton.——More than 200 prospectors have been at work on Bard creek, and during the past two weeks, over 500 locations have been made. The camp of Beshear has been established, and a townsite is to be laid out. The new goldfield is almost five miles directly west of Georgetown. Cripple Creek miners were first on the ground.

Georgetown, July 30.

GILPIN COUNTY

(Special Correspondence).—Shipments have been started from the Two-Forty mine in Russell district. The ore is a medium grade and mills from $22 to $25 per ton in gold. ——A. Merrick, manager of the Schiller mine, states that a 6-in. streak of ore has been uncovered in the bottom of the 90-ft. shaft, that contains 28% copper, with fair amount of gold and silver.——The Gilpin Orion Gold Mining Co., operating in the Bobtail district, through its manager, W. E. Meagher, states that a shaft-house will be erected and machinery ordered.——The machinery for the new mill of the Golden Sun Mining & Milling Co., has been shipped, and will arrive during the coming week. The building is practically completed.——An air-compressor is to be installed at the Grand Union property, on South Boulder creek. The erection of a mill is being considered.

Central City, July 29.

GUNNISON COUNTY

Work has been started at the Excelsior property, in Baxter basin, the air for the drills being furnished by the compressor at the Augusta, a line from which was laid when the adit was started. It is thought that the adit will open one of the ore-shoots within the next two months.—— It is reported that a smelter will be erected at the Star mine, at the base of Italian mountain. The plant will be situated within a mile of the Denver & Rio Grande line to Crested Butte. The ore is practically self fluxing, and contains a high percentage of lead.——Morner & McGruder have commenced work on their property on Baldy mountain, and will ship a trial lot of the ore to the smelter at Buena Vista.

LAKE COUNTY

A. E. Davis, who is leasing on the Big Six, at Leadville, is shipping a carload of ore per day.——In South Evans gulch, eight men are working at the Blanche, trying to pick up the shoot that produced rich ore in the early history of the property.——From the Ollie Reed, the lessees are shipping 200 tons per month.——It is reported that work will be resumed at the old Homestake mine.——The north end

of the Fanny Rawlings claim has been unwatered and the work of sinking the shaft started. ——The lessees of the Good Hope are working at the 450-ft. level. The ore at that point is similar to that found on the 250. ——The Wolverine on Upper Cariboo hill is shipping 5000 tons per month, and the Cariboo Vein 1500. ——The drift that was started a few weeks ago on the lowest level of the Cleveland has opened the vein in the granite, showing it to be of similar size and value as in the porphyry and quartzite.

QUAY COUNTY

The development at the Cardenas mine in La Glorieta district since the old workings have been drained has opened six feet of high-grade ore in the quartzite. The ore is gray copper, with lenticular pockets of native silver, assaying over 2000 oz. per ton. ——Work has been resumed at the Legal Tender shaft and it will be sunk to the contact as quickly as possible, drifts being driven from that point to the adjoining Mineral Farm ground. ——Development at the Philadelphia is opening a higher grade ore than in the past, the material now coming from the stopes being almost double in value that which was taken out a short time ago. The mill is running one shift and the problem of slime loss is being rapidly overcome.

TELLER COUNTY

A shoot of rich ore has been opened on the 700-ft. level of the Stratton's Independence, and a carload shipped that averaged 13 oz. gold per ton. The vein is in the granite. ——The fires have been started under the boilers at the Camilla mine, by the Uncle Sam Leasing Co., and the shaft will be sunk from the 200 to the 350-ft. level. ——Thomas Keegan, and associates, operating a lease on the 600-ft. level of the Blue Bird mine, shipped five carloads of ore during July, the coarse rock averaging $56 per ton, and the screening $71. The vein at this point is three feet wide, and it is believed that the lessees on the 500-ft. level have cut the same shoot. ——The Jolly Jane Mining Co., owning 14½ acres on Beacon and Bull hills, is being reorganized, and work will again be started on the property. Recent finds in the adjoining Tecumseh ground have led the stockholders of the Jolly Jane to believe that their ground may prove rich. ——The Vindicator Consolidated Mining Co. has mailed the quarterly dividend of 3c. per share, and report for the quarter, to the stockholders. The report reviews the development during the past three months, tells of the discoveries on the 1300 and 1400-ft. levels, and states that the directors of the company contemplate sinking to the 1600-ft. level. ——Cobb & Von Tilborg, leasing on the 300-ft. level of the Doctor Jack Pot, recently shipped several carloads of $25 ore. ——Sinking has been resumed in the Golden Cycle shaft at the 1400-ft. level, and will be continued to the 1700. A No. 9 Cameron sinking pump is used to raise the water to the sump on the 1400.

IDAHO

IDAHO COUNTY

(Special Correspondence).—The Elk City Mines Corporation, controlled by J. T. Omo, W. H. Stowell, R. A. Koontz, and others, of Spokane, has acquired a partly developed mine on the south fork of the Clearwater, fifty miles from Stites and six miles from Elk City. When purchased by this company the property had a 5-stamp mill and about 1000 ft. of development as adits on a 15-ft. vein. The mill is being rebuilt and enlarged to a 10-stamp plant, to have amalgamating plates and tables. The ore consists of quartz, containing free gold, and gold and silver in sulphide material. It is said to contain telluride worth $1195 per ton.—A raise from the No. 4 adit at the Jumbo mine, in the Buffalo Hump district, opened a shoot of ore, two feet of which assay over $100 per ton, when up 30 ft. This is thought to be the extension of the shoot worked from No. 1 adit, and should this prove true, the company will have about 700 ft. of backs. ——No. 3 adit at the American Eagle group, in the Elk City district, opened a body of high-grade ore. ——In the Orogrande district, the cyan

[illegible] plant has been completed and the mill is crushing 50 tons of ore per day. ——A new road is to be constructed to the Fern and Scott claims, situated on a stand [illegible] creek. ——The shaft at the Gold Edge in the Lee Mine district is down 150 ft., and a crosscut has been started toward the ore. A power plant and hoist will be installed as soon as the water rights to the place is completed.

Elk City, July 31.

SILVER BOW COUNTY

The Hecla mine, located three miles south of Kings, has been developed by a 600-ft. adit on the vein, and by a 1000-ft. drift that was run near the crown of the hill. This last cuts through the vein on the dip. There has been about 2000 ft. of drifting on the vein from four crosscuts. The property is managed by H. E. Harrington. ——Horace M. Rose, secretary and manager of the Nabob mine, near Kellogg, reports that all the machinery has been purchased and work on the long adit will be continued in a short time. He says also that the shaft on the ore is down 500 ft., with drifts on the ore from the 100, 200, and 300-ft. levels. It is figured there will have to be a crosscut of 2500 ft. from the side hill to reach the ore body. This will give a depth of 700 ft. and will drain the shaft which is full of water. The breast is in 330 ft. The company has just disposed of a block of 500,000 shares giving it ample funds to place the property on a producing basis. ——Charles H. Bell, of Spokane, president of the Best Chance Mining Co., whose claims adjoin the H. E. M. property, near Wallace, has received advices that the crosscut adit now in 760 ft. cut a vein of quartz and galena a few days ago. The ore was opened at a depth of 450 ft. and 2500 ft. west of the main workings on the H. E. M. There are 12 claims in the group, which lies a mile and a quarter up Dago Peak gulch from the Oregon Railroad & Navigation Co.'s tracks.

KANSAS

CHEROKEE COUNTY

The Boston company, at Galena, has recently completed a 300-ton mill, on a lease of the Delta land just east of the tract of 400 acres purchased by the company some time ago. The plant is one of the best equipped of any in that camp, having three concentrating tables, sand jigs, motors for hoisting, and is run by a gas engine. A centrifugal pump has been installed to raise the water. The ore is taken from an open pit, pay dirt being taken from 10 ft. below the surface. Only a trace of lead is found, zinc-blende being the main ore. The company will install a steam shovel in the near future, and will later work the deep deposits for sheet ore. ——The Diplomat mill will be ready to start operations within two weeks, the electric wiring having been finished, and an air-compressor is ready for installation. When completed this plant is expected to become one of the chief producers in the Galena camp, as it has opened one of the most promising orebodies found in that district. ——A tailing mill is being operated by James Murphy, at North Empire, and already a surplus of 200 tons of high-grade zinc ore has accumulated in the bins. ——A contract has been let for the erection of a 500-ton plant for the Omaha-Petersburg company, in the Baxter Springs camp, the mill to be one of the best equipped in the camp, and built along the sizing system, which has proved efficient for the Eastman company. Four shafts are in ore, and a fifth now under way at the mill.

Galena, July 29.

MISSOURI

JASPER COUNTY

(Special Correspondence).—There have been numerous finds in the district the past fortnight, some of which have been important. Northeast of Joplin near Turkey creek the Brattleboro Mining Co. entered rich ore at the 76-ft. level where the cuttings assayed 37%. ——A new company has taken a lease on the old Talisman land at Carterville, and after a small amount of prospecting, has found a very high grade of soft-ground ore in the roof of the old drifts above the former working levels. ——One of the best calamine

discoveries reported for some time has been made on the Saddler Mining Co.'s land at Duenweg, recently. The ground is not far from the McGee silicate mines which are the richest silicate producers in the district.——John Durby has made a rich find in four drill-holes recently sunk in the Porto Rico camp.

Joplin, July 23.

NEVADA

ESMERALDA COUNTY

The Red Top Extension Mining Co., which owns the Bull Dog fraction in the centre of the Goldfield district, is to resume work, a contract having been let for work in the shaft and additional cross-cutting. The main shaft is down 600 ft. and this will be sunk to the 1000-ft. level, while a cross-cut is driven at the 700-ft. level to a point under the 200-ft. shaft and a connection made. Considerable $9 ore has been blocked out in the property, and the operators hope to develop enough high-grade to warrant milling all this.——A syndicate had been formed to open the Rustler ground which is known as the Goldfield Florence Extension, and an attempt will be made to find the extension of the Little-Florence shoot which is supposed to cross this ground.

NYE COUNTY

(Special Correspondence).—The Pioneer lease is sending ore to the Mayflower mill from the 240-ft. level. The main stope at this point is 10 ft. wide and 40 ft. high, and has been carried forward about 60 ft. The ore is being mined in the north of the old stopes, beyond the Stark fault. This was formerly regarded as barren territory. Owing to the scarcity of water, the mill is only running at part capacity, the only source of supply being the Mayflower mine, which is being unwatered in the effort to secure 7200 gal. per day.——The Eclipse Development Co. has picked up the shoot in Tramp Consolidated below the fault. The company has driven 335 ft. on the Eclipse vein to an approximate depth of 500 ft. from surface. The extent of the new shoot is undetermined, but assays $15 to $20 per ton, about the same class of ore as that found in the upper levels. A winze will be sunk from the drift, and an electric hoist and two machine-drills installed. The 10-stamp mill is running on ore from the old workings. Harry G. McMahon is superintendent.——The Bennett-Shively lease on Tramp No. 5 has opened a shoot of ore said to assay $80 per ton, at a depth of 25 ft., 35 tons of which will be shortly treated by the Eclipse mill.——The west foot-wall drift on the 400-ft. level of Tonopah Extension is out 900 ft. and will connect with the western workings within 45 ft. The first of the three veins in this portion of the mine has been cut. It is three feet wide with milling-grade ore. The mill is handling 120 tons per day and the company is earning net profits of $18,000 to $20,000 per month.

Rhyolite, July 29.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence).—The annual shut down of the Ernestine Mining Co. for general repairs and improvements has been in evidence the past two weeks. The entire plant will again be in operation at an early date.——Sinking of the shaft at the Deadwood mines continued until the past week, when work was temporarily abandoned on account of the inflow of water. The crew has since been engaged in both the north and south drifts of the 400-ft. level.——The third Burt filter was delivered to the Socorro mines on Fannie hill during the week. When installed this will increase the capacity of the plant 30%. The June shipments of refined gold and silver bullion exceeded 32,000 oz. in addition to heavy consignments of concentrate. Approximately 3000 tons of ore were milled.——The mine crew of the Helen Mining Co. has been increased to 15 men, which will be further added to in a short time, the work at present being cleaning out and retimbering portions of the old workings preparatory to general development. Good headway is being made on the installation of the pipe-line up Whitewater creek.

Mogollon, July 22.

OREGON

BAKER COUNTY

The Oroville Gold Dredging Co. which has secured a bond on a large acreage in the Sumpter valley has commenced drilling the ground to test its value. The work will be in charge of C. W. Bigelow.——The annual meeting of the Listen Lake Gold Mining Co., operating the Listen Lake mine in the Greenhorn district, was held recently at Baker City. The company has installed a power plant and hoist within the last few months and is blocking out a good grade of milling ore.——E. N. Brigg and G. N. Start are examining the Ibex mine in the Baker City district and will reopen the property if the examination warrants.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—That the Dominion of Canada is fast becoming a cardinal factor in the world's production of the precious metals, is easily proved by some figures recently compiled, which go to show that the mineral production of the Dominion of Canada during 1909, amounted to over $92,000,000, of which nearly one-half was exported. The gold production amounted to approximately $10,000,000; copper, $9,000,000; silver, $12,000,000, coal over $5,000,000. The Cobalt district produced practically all the silver. At the present time about 38,000,000 lb. nickel matte is sent to the United States for treatment, and an attempt will be made to provide facilities for the smelting of this product within the Dominion.——On the Old Mike group, in the Bayonne district, a 100-ft. adit has been driven under the Carolina, and a good body of ore opened. A ditch, 1200 ft. long, has been constructed to the Grant-Monaghan property, with a view to sluicing off the surface soil and uncovering the vein.——S. S. Fowler, managing director of the Blue Bell zinc property, has returned from a consultation with the capitalists behind the company, in France, and it is announced that operations will be resumed at the property at once.

Rossland, July 30.

MEXICO

CHIHUAHUA

The new mill of the Lluvia de Oro mine is now being driven by the power plant completed in June. The property is expected to produce $2,000,000 in bullion and concentrate per annum.

GUANAJUATO

The Nueva Luz shaft of the Proprietary Mines Co. of America, has reached a depth of 600 metres, and a cross-cut has been started toward the vein. The distance is estimated at 900 ft. and work will be advanced at the rate of 150 or 200 ft. per month. In 1902 this work was started by the Mineral Development Co. which later was subsidized by the Mexican Government, ₱150 per metre for each metre below the 500-metre point being paid to the company. The work was stopped in 1907 on account of the financial stringency and resumed in 1908 by the Proprietary Mines Co. of America, the work being in charge of Carl Heinrich.——The cross-cut at the Humboldt mine has opened a stringer of rich ore and it is expected to tap the vein within a short distance.

HIDALGO

Work has been commenced at the Santa Inez Carretera property in the Pachuca district and the shaft is down over 20 metres. The contract calls for the completion of a 250-metre shaft within 10 months and a 75-hp. electric hoist will be installed at once to facilitate the work.——The Real del Monte company is concentrating work on the San Ignacio shaft which is being lined up and retimbered to the 525-metre level. The shaft was sunk on the dip of the vein and makes a number of angles, so rapid hoisting has been impossible. The company is to install a 250-hp. electric hoist and use self-dumping skips.——Pumping has been started at the Sonora y Ures company's shaft and sinking will be resumed as soon as the mine is drained. The company will issue 1000 shares of stock to provide the necessary capital for this work.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS

STATE SECRETARY OF MINE INDUSTRIES

The State Secretary of Mine Industries provided for by the statute of Kansas creating the State Association of Miners is ex officio State Mine Inspector and is a public officer.

Titus v. Sherwood (Kan.) 106 Pac. 1070. Feb. 10.

CONSTRUCTION OF OPTION CONTRACT TO PURCHASE MINE

On January 17, 1907, Caine and Junghandel secured a 60 day option contract from the Ludwig Copper Mining Co. for the purchase of certain of its copper mines in the State of Nevada at the stipulated price of $1,000,000, provided they paid $5000 within 30 days. The remaining payments in case of sale to be made at stated intervals. On February 7 following, Caine and Junghandel sold and assigned said option contract to F. J. Hagenbarth in consideration of $200,000, $10,000 in cash, $40,000 to be paid at the time of making the first payment to the Ludwig company, the remaining $150,000 to be paid in proportionate amounts on the dates when the other payments were to be made to the Ludwig company. Hagenbarth paid Caine and Junghandel $10,000 cash and also advanced $5000, the sum necessary to continue the option in force beyond the 30 days, making a total payment of $15,000. Hagenbarth after causing the underground workings of the mine to be examined by experts refused to take up the option and refused to purchase the property in question and made no other payment. When the first payment on the option contract became due to the Ludwig company, Caine and Junghandel demanded of Hagenbarth the payment of the $40,000 according to the agreement, and when the second payment on the option became due they demanded from him the second payment of $50,000, and on refusal to pay they instituted suit to recover on their contract of assignment. Under this state of facts the Supreme Court of Utah on appeal, reversing the decision of the lower court, decided that the assignment did not bind Hagenbarth absolutely in all events to pay the balance of the $200,000 consideration, but his liability for such amount was conditional on his completing the option, and thereby becoming obligated to pay the Ludwig Copper Mining Co. the installments and purchase price for the mine; and Hagenbarth having elected not to take up the option was not liable to Caine and Junghandel for the balance. The Court also held that the contract was not so plain as to preclude the admission of evidence of the surrounding facts and circumstances.

Caine v. Hagenbarth. (Utah) 106 Pac. 945. Feb. '10.

LOCATION OF MINING CLAIM—NOTICE

The statute of Wyoming provides that before filing the location certificate the discoverer shall designate the location by posting at the place of the discovery on the surface a plain sign or notice containing the name of the lode or claim, the name of the discoverer or locator and the date of such discovery. The statute gives the locator 60 days from the date of discovery in which to sink the discovery shaft. Under this statute notices were sufficient which were properly posted at the place of the discovery reciting that the undersigned on a stated date located and claimed a certain lode described, extending a specified distance east and west, and gave the name of the claim upon each side of the place where the notice was posted, and where such notice was placed in the shaft-house and another to the same effect was placed on a slab on the claim. Such notice was not invalidated by the fact that it was posted after midnight of the date it bore, in the absence of fraud, and when it was so posted before the initiation of any conflicting claim. The statement that on the date mentioned in the notice the locators located and claimed the lode to the extent described was a sufficient statement of the date of the discovery.

Bergquist v. W. Virginia-Wyoming Copper Co. (Wyo.) 106 Pac. 673. Feb. '10.

Personal

[illegible] are invited to send items of their engagements and travels. Such items are always welcome.

M. J. ROGAN is in New York.

A. C. LAWSON has gone to Nevada.

I. J. PETERMANN has gone to Utah.

J. H. BAKER has returned from Mexico.

R. B. RICHARDS is at Long Beach, California.

C. C. STARR is at New Canaan, Connecticut.

C. COLCOCK JONES is in the Ventura oil district.

J. F. CALLAGHAN, Jr., has been in San Francisco.

H. S. MEFFLEN, of Mexico, is at the Holland House, New York.

CHARLES E. VAN BARNEVELD was in San Francisco this week.

W. J. LORING was in Kalgoorlie, but has returned to Melbourne.

W. M. CLAYPOOL has returned to Berkeley from Hollywood, California.

N. S. KELSEY has returned from the Atlin district, British Columbia.

E. C. WOOLSEY, of the Balaklala Con. Copper Co., is in San Francisco.

M. L. SCHICKER is superintendent of the Stewart mine at Wardner, Idaho.

GEORGE MEYENBERGER, Jr., of Phillipsburg, Montana, is at Portland, Oregon.

F. A. SCHIERTZ left Shanghai August 1 for Boston by way of Hamburg.

ARTHUR L. HAMILTON, formerly of Fairbanks, Alaska, has moved to Chicago.

JOHN A. GROSS has left Walla Walla, Washington, and gone to Atlanta, Idaho.

E. E. BARCHARD has been appointed manager for the Santa Gertrudis South Co., Ltd.

J. J. STANFORD has opened an office at Wallace, Idaho, for mining engineering practice.

ALBERT BURCH will be at Bellingham, Washington, for two weeks on professional business.

CHAS. P. RICHMOND has returned from Salvador, C. A., and is now at Pomona, California.

M. S. GRIFFITHS is general manager for O. y T. Braniff, Cadereyta de Montes, Queretaro, Mexico.

FRED T. WILLIAMS has gone from Park City, Utah, to Idaho for two weeks' mine examination work.

H. B. PRICE is now mill superintendent and ROBERT GORDON is mine superintendent of the Montezuma Mines of Costa Rica.

ARTHUR REICHL, general manager for the Orenstein-Arthur Koppel Co. in the United States, is expected in San Francisco in August.

W. S. BOYD, who was with the Utah Copper Co., at Bingham Canyon, Utah, is now with the Ray Con. Copper Co. at Kelvin, Arizona.

J. A. MACKILLICAN has resigned as manager for the Michigan & Montana Development Co., Wickes, Montana, and is at the Comet mine, Hailey, Idaho.

A. C. DART has resigned the professorship of mining engineering at the Wyoming School of Mines to become general manager for the Rambler Copper & Platinum Company.

W. R. WARDNER has resigned as general manager for the Golden Star Mines Co., Polaris, Arizona, and will engage in general mining engineering practice with offices in the Bradbury building, Los Angeles, California.

GEORGE S. BINCKLEY, who has been in charge of an extensive installation for the British Columbia Railway & Power Co. the past few years, having completed his labors, is about to return to his professional practice at Los Angeles, California.

OIL DIVIDENDS FOR JULY, 1910.

From the Official Monthly Statement of Oil Securities of the San Francisco Stock Exchange.

Company.	Capital.	Shares issued.	Par value.	Acreage.	Location.	Dividend. Last date.	Amount per share.	Total to date.
Alma Oil Co.	$400,000	380,000	$1.00	120	Kern River	7 15 '10	$ 3	$182,400.00
Amalgamated Oil Co.	5,000,000	50,000	100.00	*	Salt Lake Field, L. A.	7 15 '10	1.00	1,500,000.00
Amer. Petroleum (pfd.)	2,500,000	25,000	1.00	*	Coalinga and Sherman	7 1 '10	66	250,301.35
Apollo	500,000	200,000	2.50	40	Kern River	8 20 '10	1	4,000.00
Associated Oil Stock	40,000,000	400,000	100.00	*	Kern, Coalinga, McKittrick	3 1 '07	1.50	1,548,368.54
Associated Oil Bonds 5s	3,006,000	.....	....	*	Kern, Coalinga, McKittrick	.....	....	.....
Bay City	500,000	100,000	5.00	200	Midway	6 10 '10	20	135,000.00
Blue Moon	200,000	189,759	1.00	20	Coalinga	.....	....	.....
Brookshire	500,000	500,000	1.00	933	Santa Maria and Midway	1 1 '10	1	442,500.00
California Midway	1,000,000	922,800	1.00	160	Midway	.....	....	.....
California Oil & Gas	1,000,000	900,000	1.00	80	Coalinga	.....	....	.....
Caribou Oil & Mining Co.	100,000	80,703	1.00	100	Coalinga	7 15 '10	25	781,234.74
Chicago Crude	1,000,000	1,000,000	1.00	100	Kern	3 25 '07	0½	15,000.00
Claremont	500,000	500,000	1.00	280	Kern and Coalinga	7 28 '10	2	265,000.00
Coalinga Central	500,000	450,000	1.00	120	Coalinga	.....	....	.....
Coalinga Pacific	165,000	65,000	1.00	40	Coalinga	12 23 '09	10	107,250.00
Columbia	1,000,000	999,226	1.00	*	Fullerton and Whittier	7 25 '10	½-½	414,767.35
Crescens	320,000	320,000	1.00	40	Midway	.....	....	.....
Dabney	1,000,000	1,000,000	1.00	120	Midway	.....	....	.....
Del Rey	1,000,000	785,190	1.00	40	Kern River	7 1 '10	0½	15,710.00
De Luxe	100,000	100,000	1.00	40	Coalinga	.....	....	.....
Eldorado	100,000	100,000	1.00	10	Kern River	.....	....	.....
Empire	200,000	200,000	1.00	80	Coalinga	7 31 '10	3	6,000.00
Enos	500,000	358,500	1.00	220	Kern and Santa Barbara	.....	....	.....
Esperanze	160,000	160,000	1.00	170	Coalinga	12 27 '09	9	49,450.00
Euclid	350,000	350,000	1.00	10	Kern and Coalinga	7 1 '10	1	138,000.00
Four Oil	300,000	300,000	1.00	20	Kern and Coalinga	2 25 '10	1	213,000.00
Fulton	1,000,000	100,000	10.00	120	Sunset	.....	....	.....
Globe	600,000	600,000	1.00	20	Kern River	4 1 '10	1	87,000.00
Graciosa	1,000,000	1,000,000	1.00	*	Santa Maria	.....	....	.....
Home	100,000	100,000	1.00	140	Coalinga	7 20 '10	2	482,000.00
Homestake	100,000	10,000	10.00	160	Coalinga	7 15 '10	10	79,250.00
Illinois Crude	200,000	200,000	1.00	10	Kern River	6 1 '10	1	94,000.00
Imperial	500,000	100,000	5.00	2,480	Kern and Coalinga	7 18 '10	8.00	1,000,000.00
Junction	250,000	250,000	1.00	80	Kern River	6 1 '09	1	20,000.00
Kern River	100,000	20,000	5.00	80	Kern River	7 1 '10	10	108,000.00
Linda Vista	.....	385,850	....	20	Kern River	5 9 '10	1	76,770.00
Lucile	50,000	26,704	1.00	10	Coalinga	12 20 '09	10	42,727.04
Mascot	500,000	500,000	1.00	225	Midway	7 20 '10	1	50,000.00
McKittrick	500,000	500,000	1.00	1,200	McKittrick	.....	....	.....
Mecca	500,000	422,500	1.00	120	Kern River	7 15 '09	3	71,825.00
Midway of Oregon	1,000,000	1,000,000	1.00	640	Midway	.....	....	.....
Monte Cristo	500,000	500,000	1.00	80	Kern and Sunset	7 25 '10	10	500,000.00
Mountain Girl	350,000	350,000	1.00	*	Midway	.....	....	.....
Mexican Petroleum	50,000,000	10,000,000	5.00	*	Mexico	7 1 '10	1⅓	3,324,115.17
M. & M.	1,000,000	1,000,000	1.00	140	Maricopa	.....	....	.....
Nevada County	250,000	250,000	1.00	30	Kern River	10 13 '08	4	40,000.00
New Penn. Petroleum	500,000	500,000	1.00	147	Santa Maria	7 15 '10	1	10,000.00
Palmer	2,000,000	1,802,910	1.00	880	Santa Maria	7 25 '10	1	322,141.10
Paraffine	300,000	300,000	1.00	40	Midway	6 15 '10	1	24,000.00
Peerless	1,000,000	100,000	10.00	160	Kern River	9 20 '09	6	801,060.00
Piedmont	500,000	389,000	1.00	10	Kern River	5 9 '10	1	26,877.30
Pinal	200,000	150,000	1.00	*	Santa Maria	7 31 '10	10	946,999.50
Premier	1,000,000	1,000,000	1.00	160	Coalinga	7 20 '10	1	10,000.00
Producers	500,000	80,000	5.00	600	Midway	5 1 '10	1.00	80,000.00
Radium	250,000	250,000	1.00	*	Santa Maria	.....	....	.....
Record	200,000	100,000	2.00	40	Coalinga	7 15 '10	7½	85,000.00
Republic	600,000	500,000	1.00	80	Coalinga	.....	....	.....
Rice Ranch	300,000	300,000	1.00	40	Santa Maria	6 10 '10	1	108,000.00
Rico	100,000	100,000	1.00	60	Midway	.....	....	.....
Royalty	20,000	20,000	1.00	20	McKittrick	6 13 '10	1½	22,733.33
S. F. & McKittrick	500,000	50,000	10.00	151	McKittrick	7 1 '10	30	400,000.00
Sauer Dough	100,000	199,500	0.50	270	Coalinga and McKittrick	7 21 '10	2½	737,253.50
Section 7	400,000	400,000	1.00	65	Coalinga	.....	....	.....
Section 25	40,000	40,000	1.00	200	Midway	7 26 '10	25	50,000.00
Sespon	100,000	100,000	1.00	35	Kern River	7 7 '10	6	132,000.00
Shawmut	500,000	500,000	1.00	*	Coalinga	.....	....	.....
Silver Tip	75,000	75,000	1.00	20	Coalinga	2 25 '10	10	30,000.00
Sovereign	500,000	500,000	1.00	20	Kern River	4 15 '10	1	95,000.00
S. W. & B.	400,000	377,000	1.00	40	Coalinga	9 10 '09	1	41,470.00
State	100,000	100,000	1.00	20	McKittrick	.....	....	.....
Sterling	250,000	250,000	1.00	160	McKittrick and Kern	3 15 '10	12½	778,250.00
Sunset Monarch	500,000	497,241	1.00	*	Sunset and Midway	.....	....	.....
Superior	500,000	500,000	1.00	40	Sunset	7 26 '10	1	62,500.00
Thirty-Three	500,000	100,000	5.00	160	Kern River	4 6 '10	20	690,000.00
Traders	1,500,000	15,000	100.00	410	Kern, Coalinga and Midway	5 15 '10	1.00	209,116.50
Turner	500,000	500,000	1.00	320	Coalinga	.....	....	.....
United	.....	80,751	....	*	Controls Union	7 20 '10	50	2,340,461.93
Union	50,000,000	219,626	100.00	*	All Fields of State	7 20 '10	50	6,867,507.15
Wabash	500,000	300,000	1.00	80	Coalinga	7 19 '10	20	189,000.00
West Coast (com.)	2,500,000	10,408	100.00	*	Los Angeles	.....	....	.....
West Coast (pfd.)	2,500,000	10,408	100.00	*	Los Angeles	6 15 '10	2.00	104,080.00
West Shore	100,000	100,000	1.00	80	Kern River	12 21 '08	5	235,000.00
Wolverine	100,000	100,000	1.00	60	Kern River	.....	....	.....
W. K. Oil	500,000	500,000	1.00	320	Coalinga	.....	....	.....
Western Union	1,000,000	10,000	100.00	10,000	Santa Maria	4 15 '07	2.00	481,951.00
Hanford	.....	1,000,000	....	....	.....	1 30 '06	22	80,000.00
Kern Oil	.....	.....	.....	.....	.....	11 19 '09	24½	42,000.00
Pittsburg	.....	.....	.....	.....	.....	11 11 '07	43½	124,800.00
Reed Crude	.....	.....	.....	.....	.....	5 31 '10	....	1,167,500.00

Total dividends for July 1910, $1,474,569.83; total to date, $33,607,165.11. *Information unobtainable.

Metal Prices

LOCAL METAL PRICES

San Francisco, August 4

Antimony	12 –13c	Quicksilver (flask	65, 67
Electrolytic Copper	12½–13c	Spelter	5 –5½c
Pig Lead	4.70 –5.00	Tin	32½ –33c

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead	Spelter	Silver per oz
July 28	12.25	4.40	5.01	53½
" 29	12.25	4.40	5.01	54
" 30	12.19	4.40	5.01	53½
" 31	Sunday	No market.		
Aug. 1	12.44	4.40	5.01	53½
" 2	12.44	4.40	5.01	53½
" 3	12.44	4.40	5.01	53

NEW YORK METAL MARKETS

I. Vogelstein & Co., under date of July 28, issued a circular containing the following regarding metal prices:

The outlook for metals has lately become more encouraging. This is particularly true of copper where a common sense policy seems likely to be substituted for cut throat competition. Though the effect of reduced production will not be reflected in statistics for two or three months to come, we are in a position to confirm the report that producers will curtail their output and it looks to us as though purchases of copper metal at present prices ought to be more attractive than copper shares, at least for those who have missed the opportunity to buy at the bottom, because shares have already recovered 10 to 15% from the low point, while Standard Warrants in London have advanced only about 55 shillings, or less than 5%, and electrolytic copper in New York barely ⅛c. per lb. or 1%. Spelter by its resistance to further declines gives promise of responding freely to improved conditions. A price of 5c. for this metal, like 12½c. for copper, seems to mark the bottom. Lead, while doing better of late, is susceptible of further improvement. Tin, not having previously declined, is in an uncertain position. Without knowing the intentions of the Tin Syndicate, the future is hard to predict, but apparently liquidation, unless forced, will not be encountered. Currently there is a good volume of business.

JOPLIN LEAD AND ZINC

The *News Herald* figures for the week ended July 23, 1910, are as follows: The high price for blende was $44 per ton, and the average on all lots was $38.33, compared with $38.20 for the previous week. St. Louis spelter was strong at $5.10 compared with $5.025 close of the preceding week. Calamine ores brought as high as $27 on an assay basis of $24 for 40%. The basis ranged down to $20, the average price per ton compared with last week's quotation of $26.70. The average price for lead ore was $48.17 compared with an average of $48.62 last week. The high price was $49, pig-lead closing at $4.35. The value of shipments from each district was as follows: Joplin: Blende, $44,733; calamine, $588; lead, $5,234. Total, $50,564. Webb City-Carterville: Blende, $76,701; lead, $17,052. Total, $93,843. Galena: Blende, $6,853; lead, $1,323. Total, $8,176. Granby: Blende, $8,881; calamine, $6,975; lead, $365. Total, $16,221. Duenweg: Blende, $10,491; calamine, $1,534; lead, $2,940. Total, $14,965. Miami: Blende, $5,265; lead, $1,536. Total, $6,801. Alba-Neck City: Blende, $11,097; lead, $100. Total, $11,197. Spring City-Spurgeon: Blende, $3,610; calamine, $576; lead, $1,600. Total, $5,786. Carthage:: Blende, $3,720. Badger-Peacock: Blende, $5,148. Greenfield: Calamine, $385. Carl Junction: Blende, $1,600. Sarcoxie: Blende, $2,535. Cave Springs: Blende, $1,560. Stotts City: Blende, $1,216. Summary for the district: Blende, 9,575,750 lb.; calamine, 835,650 lb.; lead, 1,253,070 lb. Values: Blende, $183,500; calamine, $9,878; lead, $30,159. Total, $223,537. The surplus of zinc ore was cut from 9,259 tons to 8,881, but the lead ore surplus increased from 3,727 to 3,800 tons.

JULY COPPER REVIEW

By Merton E. Armstrong*

The copper market [illegible] the month of July was [illegible] and sales were made as low as 12½c. delivered Chicago, for electrolytic. On the 15th the price was lifted an ⅛ to ¼c. In the review for the month of June I indicated that the key to the whole situation was curtailment of production and that the producers had begun to realize this. It now seems that the leading producers have arranged to cut down production, and as a result during the last few days of the month copper advanced sharply with every indication that it will advance to a 13 or 13½c. I expect to see the market remain on that level for a few months, and as the surplus begins to decrease sharply because of the curtailment there should be further advances, although it is hoped that the advance will not be extreme, thus defeating the object of the move. Deliveries for the month of July are about 75,000,000 lb for export and about 60,000,000 domestic, which would indicate a surplus of at least 10,000,000 lb. The mines, however, may have begun to curtail early this month and in that case the production would be less. For the first time in many years, the metal situation has been put on a sound basis. With improvement in business in the fall the average price of copper should become satisfactory.

*President New York Metal Selling Company.

CURRENT PRICES FOR CHEMICALS

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as packed. For round lots lower prices may be expected while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min	Max
Acid, sulphuric, com'l, 66°, drums, 100 lb	$0.90	$1.25
Acid, sulphuric, com'l 66°, carboy, 100 lb	1.00	1.50
Acid sulphuric, C.P. 66lb bottle, bbl., lb	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb	0.03½	0.12
Acid, muriatic, com'l carboy, 100 lb	1.50	2.00
Acid muriatic, C.P., 6-lb bottle, bbl., lb	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb	7.25	6.50
Acid, nitric, C.P., 7-lb bottle, bbl., lb	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb	0.12½	0.15
Argols, ground, bbl., lb	0.20	0.25
Borax, cryst and conc., bags, 100 lb	2.75	3.85
Borax, powdered, bbl., 100 lb	3.00	4.00
Borax, glass, ground, 30 mesh, kegs, 100 lb	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb	4.50	5.50
Bromine, 1-lb bottle, lb	0.55	0.65
Candles, adamantine, 12 oz., 10 sets to case	3.50	4.15
Candles, adamantine, 14 oz., 10 sets to case	4.00	4.55
Candles, Stearic, 12 oz., 10 sets to case	4.95	5.50
Candles Stearic, 14 oz., 10 sets to case	4.65	5.20
Clay, fire, sack, 100 lb	1.50	2.00
Cyanide, 98 to 100%, 100-lb case, lb	0.20¾	0.24½
Cyanide, 98 to 100%, 200-lb case, lb	0.20	0.24
Cyanide, 125 to 127%, 100-lb case, lb	0.27½	0.28½
Cyanide, 125 to 127%, 200-lb case, lb	0.26¾	0.27½
Lead acetate, brown, broken casks 100 lb	8.75	9.00
Lead acetate, white, broken casks 100 lb	10.00	10.25
Lead acetate, white, crystals 100 lb	11.75	12.25
Lead, C.P., cast, gran., 100 lb	13.00	15.00
Lead, C.P., sheet, 100 lb	15.00	18.00
Litharge, C.P., silver free, 100 lb	10.50	13.00
Litharge, com'l, 100 lb	7.00	8.50
Manganese ox., blk., dom. in bags, ton	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton (85% MnO_2—3.4% Fe)	45.00	50.00
Mercury, 75-lb flask	18.00	19.00
Nitre, double ref'd, small cryst., bbl., 100 lb	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb	7.25	18.00
Potassium bicarbonate, cryst., 100 lb	12.00	15.00
Potassium carbonate, calcined, 100 lb	15.00	18.00
Potassium permanganate, drum, lb	0.11	0.12½
Silica, powdered, bags, lb	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb	1.50	1.75
Soda, bicarbonate, bbl., 100 lb	2.00	2.50
Soda, caustic, ground, 98%, bbl., 100 lb	3.15	3.50
Soda, caustic, solid, 98%, bbl., 100 lb	2.65	2.85
Zinc dust, 1100-lb. casks, 100 lb	8.50	9.50
Zinc shavings, 800 fine, bbl., 100 lb	10.50	11.50
Zinc sheet, No. 9—48 by 84, drum, 100 lb	9.50	10.50

Market Reports

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 28. £ s. d.	Aug. 3. £ s. d.
Camp Bird	1 7 0	1 7 0
El Oro	1 5 3	1 5 6
Esperanza	2 13 9	2 13 9
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 3	0 6 3
Mexico Mines	8 15 0	8 12 6
Tomboy	0 16 6	0 16 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Aug. 4.		Closing prices, Aug. 4.
Adventure	5¼	Mohawk	46
Allouez	39	North Butte	23¾
Atlantic	5⅛	Old Dominion	35
Calumet & Arizona	58½	Osceola	122
Calumet & Hecla	520	Parrot	12⅛
Centennial	16½	Santa Fe	1⅛
Copper Range	61½	Shannon	9½
Daly West	6⅞	Superior & Pittsburg	11⅛
Franklin	10	Tamarack	50
Granby	31	Trinity	5
Greene-Cananea, ctf	6⅞	Utah Con	23⅛
Isle-Royale	16⅛	Victoria	2¼
La Salle	9¼	Winona	6
Mass Copper	6¾	Wolverine	110

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Aug. 4.		Closing prices, Aug. 4.
Amalgamated Copper	62	Miami Copper	19⅞
A. S. & R. Co	66½	Mines Co. of America	⅝
Boston Copper	18¾	Montgomery-Shoshone	7/16
B. C. Copper Co	4⅞	Nevada Con	19
Butte Coalition	18⅛	Nevada Utah	½
Chino	11⅝	Nipissing	10½
Davis Daly	1⅜	Ohio Copper	1⅛
Dolores	6	Ray Central	2¼
El Rayo	38¾	Ray Con	17⅛
Ely Central	⅝	South Utah	1¾
First National	3¼	Superior & Pittsburg	11
Giroux	6¼	Tenn. Copper	23
Guanajuato Con	1	Trinity	4¾
Inspiration	7	Tuolumne Copper	2⅛
Kerr Lake	7⅛	United Copper	4¾
La Rose	3¾	Utah Copper	44
Mason Valley	6⅞	Yukon Gold	3⅜

SOUTHERN NEVADA STOCKS.

San Francisco, August 4.

Atlanta	$ 14	Mayflower	$ 3
Belmont	3.95	Midway	25
Booth	13	Montana Tonopah	98
Columbia Mtn	6	Nevada Hills	2.21½
Combination Fraction	48	Pittsburg Silver Peak	58
Daisy	4	Rawhide Coalition	15
Fairview Eagle	40	Rawhide Queen	25
Florence	2.40	Round Mountain	45
Goldfield Con	8.40	Sandstorm	4
Gold Kewenas	6	Silver Pick	8
Great Bend	3	St Ives	13
Jim Butler	23	Tonopah Extension	83
Jumbo Extension	54	Tonopah of Nevada	8 25
MacNamara	31	West End	61

(By courtesy of San Francisco Stock Exchange.)

COMSTOCKS.

San Francisco, August 4.

Alpha	$ 8	Hale & Norcross	$ 34
Alta	9	Julia	8
Andes	17	Justice	9
Belcher	70	Kentuck	10
Bullion	11	Mexican	1.27
Brunswick Chollar	16	Occidental	40
Brunswick Potosi	15	Ophir	1.17
Caledonia	51	Overman	85
Cassidy	26	Potosi	30
Challenge Con	18	Savage	20
Chollar	17	Scorpion	7
Confidence	89	Seg. Belcher	22
Con. Imperial	6	Sierra Nevada	30
Con. Virginia	1.00	Silver Hill	6
Crown Point	55	Union	38
Exchequer	17	Utah	7
Gould & Curry	21	Yellow Jacket	64

(By courtesy of San Francisco Stock Exchange.)

OIL SHARES.

San Francisco, August 4.

Alma	$ 1.00	Occidental	$ 25
Apollo	13	Palmer	1.42
Associated Oil	44.25	Paraffine	1.00
Bay City	2.75	Pinal	7.00
Blue Moon	20	Premier	80
Brookshire	1.57	Record	5.25
Caribou	15.00	Republic	46
Claremont	1.30	Sauer Dough	1.85
De Luxe	1.60	Silver Tip	2.05
Empire	1.50	S. W. & B.	40
Enos	1.27	Sterling	2.00
Fulton	2.00	Turner	1.70
Illinois Crude	50	Wolverine	25
Monte Cristo	3.27	W. K. Oil	3.20
Nevada Midway	23	Yellowstone	30

(By courtesy of San Francisco Stock Exchange.)

CURRENT PRICES FOR ORES AND MINERALS

(Corrected monthly by Atkins, Kroll & Co.)

The prices are approximate, subject to fluctuation, and to variation according to quantity, quality, and delivery required. They are quoted, except as noted, f.o.b. San Francisco.

	Min.	Max.
Antimony ore, 50%, per ton	$25.00	$35.00
Arsenic, white, refined, per lb	0.03	0.03½
Arsenic, red, refined, per lb	0.08	0.09
Asbestos, according to length and quality of fibre, per ton	100.00	350.00
Asbestos, lower grades, per ton	10.00	100.00
Asphaltum, refined, per ton	15.00	20.00
Barium carbonate, precipitated, per ton	42.50	45.00
Barium chloride, commercial, per ton	42.50	47.50
Barium sulphate (barytes), prepared, ton	20.00	30.00
Bismuth ore, 10% upward, per ton	75.00	upward
Chrome ore, according to quality, per ton	5.00	15.00
China clay, per ton	15.00	20.00
Cobalt metal, refined, f.o.b. London, per lb	2.50	
Coke, foundry, per 2240 lb	15.00	17.50
Diamonds:		
Borts, according to size and quality, per carat	2.00	15.00
Carbons, according to size and quality, per carat	75.00	100.00
Feldspar, per ton	5.00	25.00
Firebrick:		
Bauxite, per M	175.00	200.00
Magnesite, per M	200.00	250.00
Silica, per M	47.50	
Flint pebbles for tube-mills, per 2240 lb	15.00	25.00
Fluorspar, per ton	8.00	15.00
Fullers earth, according to quality, per ton	10.00	30.00
Gilsonite, per ton	32.50	45.00
Graphite:		
Amorphous, per lb	0.01	0.02½
Crystalline, per lb	0.04	0.13
Gypsum, per ton	2.50	5.00
Infusorial earth, per ton	5.00	15.00
Magnesite, crude, per ton	5.00	7.50
Magnesite, dead calcined, per ton	22.50	27.50
Magnesite, brick (see firebrick).		
Manganese ore, oxide, crude, per ton	10.00	25.00
Manganese, prepared, according to quality, per ton	45.00	125.00
Mica, according to size and quality, per lb	0.05	0.30
Molybdenite, 95% MoS_2, per ton	400.00	500.00
Monazite sand (5% thoria), per ton	150.00	200.00
Nickel metal, refined, per lb	0.45	0.60
Ochre, extra strength, levigated, per lb	0.02½	0.03½
Platinum, native, crude, per oz	20.00	25.00
Quicksilver, per flask (75 lb.)	45.00	48.00
Scheelite (see tungsten ore).		
Sulphur, crude, per ton	15.00	25.00
Talc, prepared, according to quality, per ton	20.00	50.00
Tin ore, per ton	250.00	400.00
Tungsten ore, 65%, per ton	475.00	525.00
Vanadium ore, 15%, per ton	120.00	150.00
Wolframite (see tungsten ore).		
Zinc ore, 50% up, per ton	15.00	20.00
Zinc dust, 90% minimum, per 100 lb	8.50	9.50
Zinc oxide, per 100 lb	7.50	8.50

Dividends

The Bunker Hill & Sullivan Mining, Concentrating & Smelting Co. paid dividend No. 155 of $98,100 on August 5. This makes the total for the year $647,400, and to date $11,933,400.

Amalgamated Copper Co. has declared a dividend of 50c. per share, payable August 29 to stockholders of record July 30.

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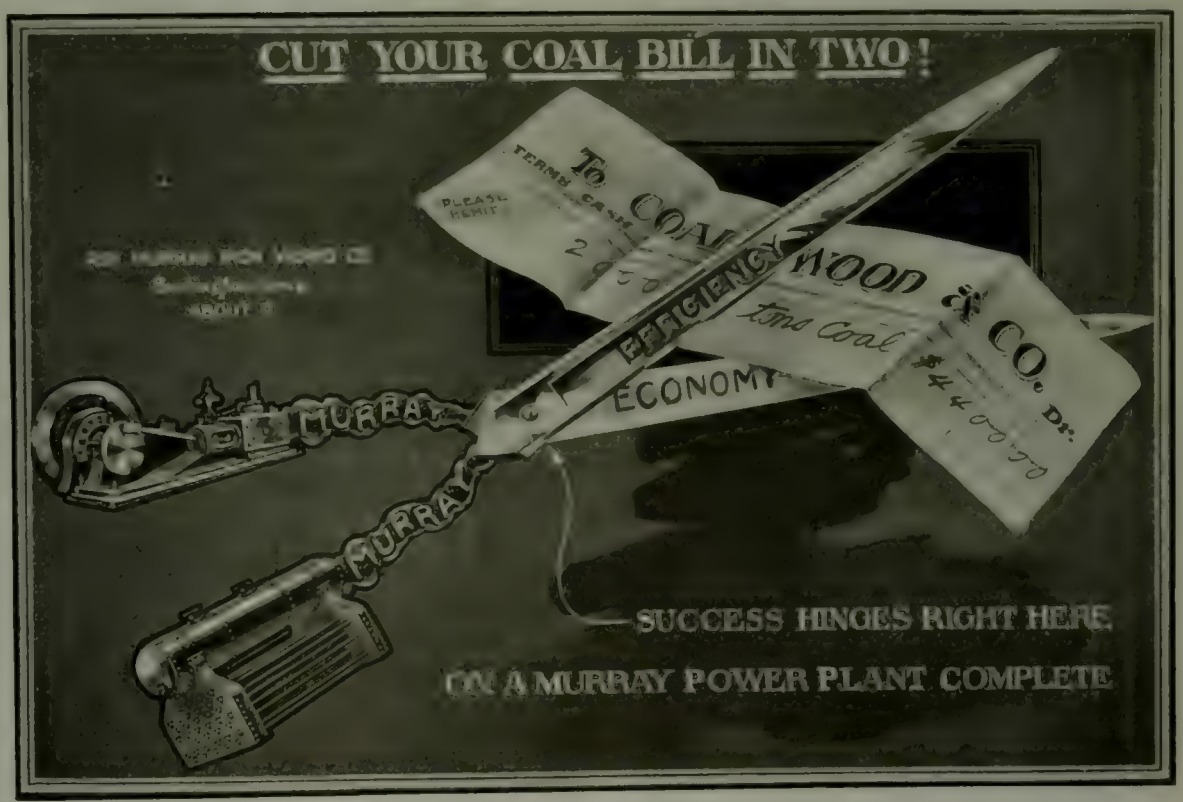

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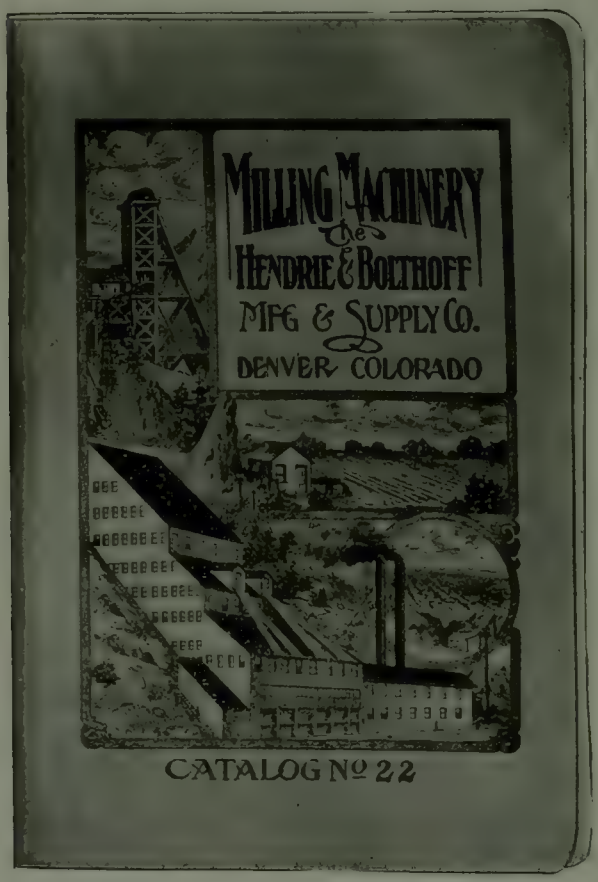

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EDITORIAL

BUTTE men won the Ryan $1000 prize at Calumet, Michigan, July 30 by drilling 53½ inches in granite in 15 minutes. This sets up a new world's record for double hand drilling, surpassing that of 48¼ inches made at El Paso, Texas, in 1904.

COBALT continues to furnish thrills in the way of discoveries of rich ore. The Temiskaming & Hudson Bay mine, which incidentally has paid 16,600 per cent on the investment, has produced the latest sensation in a 10-inch body of ore assaying 6000 ounces per ton, found 100 feet below the surface. Such masses of silver are especially welcome to the owners now that the price has improved.

ARRANGEMENTS are being made by Los Angeles members of the Mining and Metallurgical Society of America, for a society dinner, September 28, at the time of the meeting of the American Mining Congress. Possibly also a short field trip will be planned. Mr. Seeley W. Mudd has the matter in hand and visiting members may feel assured of an excellent time. All members of the society are requested to reserve the date.

FIRE has made another visit to the offices of the Geological Survey at Washington, but the firemen are becoming so expert in fighting flames in that particular building that little damage was done. We sincerely hope there may be no further delay in providing proper quarters for the maps and records now constantly in danger. Their destruction would entail widespread loss and we trust that this winter Mr. James R. Mann will restrain his customary propensity to object when the matter comes before Congress.

ILLINOIS is the first State to take up the mine-rescue work for itself. The matter has been placed by the Governor in charge of a commission consisting of Messrs. J. W. Miller and J. L. Schmidgall representing the operators, Charles Bennett and Charles Krallman, of the miners, Hector McAllister, inspector, H. H. Stock of the University, and J. A. Holmes of the U. S. Bureau of Mines. It has been decided to spend $30,000 on three station buildings, $42,800 on equipment and maintenance, and to reserve $7200 for contingencies. Arrangements will probably be made also to equip railway cars with apparatus for demonstration and regular rescue work, and to keep them ready for instant service. Such close co-operation as is indicated by the make up of this commission, appointed in the midst of acute labor troubles, is striking, but this is only another of the many evidences that a dispute as to wages concerns economies and is not a personal matter.

MAIL service in Alaska is far from perfect. In the winter months deliveries of second-class matter to interior points are so slow and uncertain that there are frequent complaints. Copies of the *Mining and Scientific Press* for November 6 reached Nome, January 16, and those dated November 13 arrived June 5. Up to June 24, after steamers began to arrive, the numbers for February 19, March 5, and March 12, had not arrived though later numbers were at hand. This sort of service is inexcusable. Alaska deserves better treatment at the hands of Washington authorities.

DESIGNING a complete mine plant is not easy and any set of plans is subject to criticism. We take pleasure none the less in presenting the first part of a thesis covering plans for a plant to meet conditions that are not uncommon. The study illustrates the method of attack and also the sort of knowledge required of graduates at the Colorado School of Mines. We trust that the authors, Mr. J. W. Whitehurst and Mr. W. P. Cary may live to design and operate even larger and more complex plants than the one they have worked out as students.

OUR London contemporary, *The Mining Magazine*, has been usurping imperial powers in sending Mr. Ross B. Hoffmann to Siberia with Mr. J. P. Hutchins. In the past many men have been sent unwilling to the Siberian mines, but Mr. Hoffmann protests that he has not gone and has no intention of going. That mistakes in such matters will happen we are reminded by having inadvertently announced that Mr. Donald Foster is metallurgist for the Torres Mine, Ltd., Cherokee, Mexico. Mr. A. W. Allen is metallurgist for the Cherokee Goldfields, Ltd., at San Julian, Mexico, and Mr. Foster is his assistant. It is but fair to add that Mr. Foster was in no way responsible for the error.

THE FIFTEENTH annual meeting of the Lake Superior Mining Institute will include sessions at Ironwood, Michigan, August 24, at Chicago, Illinois, the 25th, and at Gary, Indiana, on the 26th. Thus the members will follow the ore of the Gogebic range from the mine to the steel billet, incidentally, we observe, pausing long enough to see the 'Cubs' contest with the 'Giants' at the National League ball park in Chicago. The field meetings of the Lake Superior Institute have an excellent and well-deserved reputation. They bring the engineers together and have done much to promote the personal and professional friendly feeling which obtains about Lake Superior and which makes that district more like the Rand than are many others in America.

SHASTA county, California, is feeling the effect of the enforced closing of the copper smelters. Many men are out of work, train service on the branch railway lines is disorganized, and the small gold mines that furnished quartz to the smelters are closing. Operations at the limestone quarries are suspended and indeed there is little activity except at the smelters, where work on new installations is being rushed. At Coram it is expected that the new precipitating plant will be ready to operate October 1. At Kennett the third furnace of the Mammoth Copper Mining Company has been connected with the bag-house with excellent results. The dust contains a high percentage of zinc oxide and zinc sulphate, but is readily handled. It is to be briquetted and returned to the blast-furnace.

Mining Bureau Work in Metal Mines

Members of the San Francisco Section of the Mining and Metallurgical Society of America have been particularly interested in the establishment of the Bureau of Mines at Washington. At the recent meeting at Grass Valley, the problems which the new Bureau might properly investigate came up for discussion. It was at once apparent that more were waiting than the most active corps of engineers could hope to solve in many years. In view of the large interest that Western men have in the work of the Bureau it was thought proper to attempt to reach some concensus of opinion as to the most pressing problems of metal mining and metallurgy. It is thought that a few well chosen recommendations will be welcomed by the officers of the Bureau and that Congress will be glad to appropriate funds for any reasonable amount of work of real importance and probable usefulness. Accordingly a committee was appointed to compile suggestions and submit them for discussion at the next meeting of the Section. Suggestions from engineers and others will be welcomed and may be addressed to the local secretary, Mr. H. Foster Bain in care of the *Mining and Scientific Press*. The work of the Bureau this year is, as already announced, to be concerned mainly with the problems of coal mining. Metal mines, however, have their own dangers and losses and are as worthy of aid. However willing the Acting Director, Mr. George Otis Smith, and his assistants may be, they cannot act except as Congress appropriates money and if Western men really have problems properly falling within the field of the Bureau, a matter about which the East seems in some doubt, they should make their influence felt. In the meantime we understand that the general investigation of the causes of mine accidents is to be broadened so as to cover metal as well as coal mines, and is to be under the immediate direction of Mr. George S. Rice, a thoroughly competent engineer whose assignment to this important work should remove all doubt as to the character of the men who will be employed.

Possibilities of the Rand

There has been in many quarters an impression that the output of the Rand in the Transvaal had about reached its maximum and that the total quantity of ore available was fairly well known. Some ten years ago Mr. John Hays Hammond, in an address made at Harvard University, estimated the remaining life of the mines at approximately thirty years and the total gross output at three billion dollars. Since then the number of stamps dropping has greatly increased. At the close of last year 9545 were in commission and more building. By increasing the weight and by adding tube-mills, the output per

stamp has been reached it would seem that serious depletion at the mines should begin to show. Instead the large companies continue to report increased reserves and the June output is estimated at 640,000 ounces, the largest monthly return yet made. The annual production is now above $\$$30,000,000 and without signs of exhaustion. Indeed Mr Lionel Phillips director for the Rand Mines Limited in an address recently delivered at Johannesburg indicates that present production marks but a fair beginning rather than a climax. It is thought that the number of stamps will have to be doubled in the next decade. Improvements in mining and milling have offset decrease in value of the ore and higher labor costs, and Mr Phillips sees no immediate limitation of output. Indeed, he estimates the base of life for the Rand as likely to extend through the century, and the potential production at ten billion dollars. To win this vast amount of gold will involve working at depths of 7000 feet and handling immense quantities of rock. It is perhaps significant that just at present an increasing number of engineers are drawn to the district whose experience has been largely in coal mining. The future Rand mine will resemble a colliery more than the old type of metal mine. Ventilation will become of primary import and economical handling of quantities of material will be the main consideration. On these two points the colliery engineers can give valuable pointers to metal miners, and the 'deep deeps' of the Rand need the best services of engineers from all fields.

Petroleum and the Navy

Why the Navy does not adopt oil for fuel is being frequently asked, especially in California. About six years ago the matter was fully investigated by a 'Liquid Fuel Board' which made many tests and an elaborate report. No particular mechanical or technical difficulties were found to stand in the way of the adoption of petrolum but, in the opinion of the officers investigating the matter, the difficulty of insuring an adequate supply was such as to make the change from coal then inadvisable. Since that time there has been a great increase in production not only in America but abroad. In the United States the great Midcontinental field has been developed and connected with the Gulf Coast by pipelines. In California there is an abundance of petroleum which can be delivered to the ships at rates much below the cost of equivalent coal. The Mexican fields have come into the market and Russian production is greater than ever. Some wells have been brought in, not far from Manila, in the Philippines, and the prospect for a large production seems good. If big pools be opened there, the last objection to the change would be removed since adequate supplies would be available on all the coasts where the Navy has much occasion to maintain fleets. There are many advantages, other than economy, resulting from the use of oil on board steamers. The quickness with which steam can be raised would seem to be especially important in naval work. The steamer *Harvard*, of the Metropolitan Steamship Company, would probably have been destroyed when it caught fire July 4 except for the fact that it is an oil burner. At the time of the accident the boat was at dock and had no steam, but pressure was raised so quickly that only slight damage was done. Special promptness might well save us a battleship at a critical time and the whole problem demands reinvestigation. We understand it will be brought to the attention of the American Mining Congress at the Los Angeles meeting. Great Britain is said to be about to adopt oil for naval fuel and there would be much less difficulty to be met in the case of the American than the English Navy.

Conservation and a Warning

In a clear and well reasoned editorial in the *Journal of Geology*, Mr T C Chamberlin calls attention to a growing confusion of thought regarding certain phases of the conservation problem. "The protection of natural values against wastage," he says, "is one thing, the possession of these values is quite another. The best conservation may not be correlated with the best ownership. Ownership, desirable on other accounts, may be an obstacle to conservation, and ownership, otherwise undesirable, may be tributary to conservation. This is so because, in their fundamental nature, the problems of conservation and the problems of possession are distinct questions, each to be solved in its own way and on its own basis. They centre in separate fields. The conservation of natural resources centres in the scientific and the technical; the right of ownership and the most desirable distribution of ownership centre in the political and the sociological. The best conservation of the soil is not necessarily dependent on the most desirable partition of the land. All questions of the possession and distribution of values may be marshaled under extreme individuality, extreme monopoly, or some combination of individuals and corporations lying between these extremes, but all are alike political and sociological in nature and, however they may issue in practice, they leave the scientific and technical problems of conservation of natural resources to be solved on their own bases. And these solutions must be fundamentally much the same under any political or sociological system." He points out that the special responsibility of geologists in the work is with the scientific and technical problems of conservation rather than with matters of ownership, in regard to which their opinions are inexpert. He pays a deserved tribute to the long quiet work of the Geological Survey in the matter of conservation and appeals to his fellow workers for clearer thinking in regard to the matter. His words will carry great weight not only with geologists, but others, because of his standing as the leading geologist of the United States, and a man also well versed in public affairs. It is becoming increasingly evident that conservationists are not all in one camp and that much honest difference of opinion exists as to the proper procedure. The meeting of the Conservation Congress at St. Paul, Minnesota, in a few weeks will be watched with much interest and will probably prove of great significance as to future direction of the movement.

Mines in Republic District, Washington

By W. A. Scott

The mining district of Republic is about thirty miles south of the international boundary, and was at one time included in the Colville Indian reservation, in Ferry county, Washington.

The Republic Con. Gold M. & M. Co., organized in the State of Washington, but controlled by Montreal men, purchased the original Republic mine of Patrick Clark about ten years ago and spent a large sum of money on development and equipment. A crushing mill and cyanide plant of large capacity were erected, the construction and operation of the mill having been in the name of the Republic Cyanide & Power Co., a subsidiary of the other company. After a failure to operate profitably, both mine and mill were closed down and the property was practically abandoned. The title to the mine and its equipment passed two years ago to Ferry county by virtue of sale to satisfy a lien for delinquent taxes; the title to the mill-site, however, is still vested in the Republic Cyanide & Power Co., though the plant has been partly dismantled. An effort was made in 1909 by stockholders of the mining company to invalidate the tax deed to the mine and contiguous holdings, but it was unsuccessful. In 1908, after tax title had passed to the county, the mine was leased to the Republic Leasing Co., organized by a number of miners of the district, who soon transferred their lease to the New Republic Mines Co., which now has a lease and option to purchase extending to March, 1912. Prominent in this company are Frank B. Babcock, of Cheney; R. J. Howard, of Spokane; W. B. Parker, J. L. Harper, and others. Mr. Harper was manager for the company till November 13, 1909, and during the year or more that he was in charge the mine is said to have shipped to Tacoma a sufficient tonnage of ore to net the company about $100,000, some of which was spent in development and equipment. Dissensions among the stockholders arose, and suits were filed to settle their troubles. One result was that Mr. Harper ceased to be manager, and Mr. Howard took charge last November. Just now little is being done except to keep four men at work on the property in order to hold the lease. The mine is opened by a 2250-ft. cross-cut adit driven to the orebody. From the intersection of the adit a drift was driven 350 ft. south on the vein and 90 ft. north, and above this level a great deal of stoping has been done.

Part of Surprise Mine, Republic, Washington.

In the meantime the Pacific Ore Co. has been organized by J. L. Harper, Robert Mabray, L. W. Anderson, E. R. Davidson, and others, all of whom are interested in the mines of Republic. The purpose is to operate a custom mill in the district which can profitably treat the ore too low grade to stand transportation and smelting charges. The construction of this mill is in progress. It involves crushing, pulverizing by Chilean mills, and cyaniding in agitating tanks, the Hess system of agitating and aerating having been adopted.

The Pearl Con. Mining Co., with Charles P. Robbins, of Spokane, as president, about eight months ago gave a bond on its Surprise, Pearl, and Lone Pine claims in Republic to the Republic Mines Corporation, for which J. L. Harper is general man-

ager. The price is said to be $[illegible]. The property lies on the east side of Eureka gulch, and is a portion of a north-south vein recently opened in the Mother Lode. Work was begun here by Mr. Harper last January, and within six months from that time the Republic Mines Corporation has shipped 163 car loads of ore to Tacoma, aggregating 6814 tons, having a gross value of $47.31 per ton, and a net value of $36.04 per ton. The June shipments of 11 cars had a gross value of $11,2000 and gave a net return of $9,000. July shipments will hardly come up to those for June. The railroad companies charge a minimum rate of $2.50 per ton from Republic to Tacoma, and a maximum of $4 on ore sampling $60 per ton or higher. The minimum treatment charge against Republic ores at Tacoma is $3.50 per ton. The shipper also gets 5c per unit for all lime over 5%. Ore from the Pearl and Lone Pine workings carries 30% lime. It is understood that payments by Harper to the Pearl Con. Mining Co. have thus far amounted to $120,000, and that dividends to the amount of $25,000 have been paid to stockholders in the Republic Mines Corporation. The Surprise workings consist of an 80-ft. crosscut adit to the vein with 140 ft. of drift north on the vein and 450 ft. south; and a 40-ft. winze in ore from the main level. The Jim Clark crosscut has been driven to the vein from the bed of the gulch, and 60 ft. lower than the principal level. These workings disclose an ore-shoot 600 ft. long and 8 ft. wide. All the ore between the porphyry walls is said to be shipped. The Lone Pine has 3000 ft. of the same vein, and has also a lateral vein. The principal development is at the intersection of the two lodes. While most of the ore shipments have been, so far, from the Surprise, the Pearl and Lone Pine are to begin shipping. An incline shaft is being sunk from the bed of the gulch, which is intended to cut the Surprise vein at about 500 ft. depth.

The Insurgent Leasing Co., controlled by E. J. Delbridge and Merrill Bros., has a lease on two fractional claims belonging to the Insurgent M. Co., principals in which are G. B. Dennis and others of Spokane. This ground adjoins the Lone Pine on the north and has the extension of the latter's east and west vein system. The Insurgent workings are now entered through the Lone Pine adit, which goes in 600 ft. and cuts the Insurgent ore at a depth of 180 ft. Most of the ore now being mined by the Insurgent lessees is taken from short drifts from an 80-ft. winze sunk from the principal level. Mining is done with power-drills driven by a Leyner compressor, and the hoisting is by steam power. Mr. Delbridge states that shipments are being made at the rate of 45 cars per month to the smelters at Grand Forks and Greenwood, B. C., the ore averaging $17 per ton. It contains 80% silica and is in demand at those plants for converter lining. The freight rates to those places are $1 per ton on $15 ore, and $1.50 on ore running higher; the treatment charges are $5.25 to $7 per ton.

The Knob Hill group of two claims is situated close to where Eureka gulch forks and has the northern extension of the Lone Pine-Surprise lode. This belongs to the Jonathan Bourne interests, but it [illegible] Eureka gulch and owned by the Knob Hill M. Co., which is controlled by J. W. Lloyd and associates of Spokane. Work has commenced on a 150-ft. crosscut which is expected to reach the vein at a depth of 264 ft. By running on the vein from this crosscut a connection will be made with the old workings. It is said the property has a 30-in. streak of ore which assays over $40 per ton. The wider portion of the vein carries low grade but still profitable ore.

On the west side of Eureka gulch is the San Poil vein, parallel to the Surprise-Lone Pine vein and 600 ft. distant. The San Poil, Ben Hur, Trade Dollar, North San Poil and Beebe are the most important properties on the San Poil lode. The Ben Hur is in the hands of the Ben Hur Leasing Co., whose lease runs five years and seven months. Up

Mother Lode on Surprise Claim, Republic, Washington.

to June 15, 1910, between 90 and 100 cars of ore had been shipped to Grand Forks and Greenwood, the grades having been from $10 to $30 per ton. Work ceased last month, and those in control have plans for milling their ore. The property is opened by a 790-ft. adit and a vertical shaft, the workings extending to a depth of 400 ft. A. B. Hurd, A. M. Kingston, and A. W. Frazer, of Grand Forks, and G. W. Fairweather, S. Ferguson, and James T. Johnson, of Republic, are the men comprising the leasing company.

The San Poil lode seems a promising one. Some work is being done on the other properties. Most of the mines and prospects of this part of the district are on or close to Eureka gulch, which drains southerly into San Poil river.

The Colville Mining & Smelting Co., H. J. Lycett, manager, has 28 claims at Park City, 25 miles south of Republic, on which development is in progress, which has resulted in opening bodies of galena of good grade. This is controlled by Eastern people.

Design of a Mine Plant

By J. W. Whitehurst and W. P. Cary

Part I—Pumps and Surface Plant

*Problem.—The problem presented for solution was to design and lay out a plant and select machinery and equipment for a mine operated through a 1000-ft. vertical shaft. It is proposed to hoist 225 tons (75 tons of ore, 150 tons of waste) 12 hours per day, through a 3-compartment 4 by 4½-ft. shaft (2 hoisting, 1 manway). Practically all ore has been stoped above the sixth level and the output is to be taken from the seventh, eighth, ninth, and tenth levels, still to be opened. A sump 10 by 13 ft. is to be cut near the shaft on the 980-ft. level; a pump placed there is to deliver to the surface 100 gal. of water per minute under a total head of 1000 ft. Surface conditions have been assumed similar to those of the New Monarch mine, situated about six miles east of Leadville, Colorado, near the headwaters of Big Evans gulch. The altitude here is approximately 10,500 ft. above sea-level. This is a district of strong winds with severe winters and heavy snowfall, wherefore an allowance is made for a ten-day blockade in transportation. The excessive cost of fuel at the mine has favored an electrical installation; current to be purchased from an independent company. It is upon the foregoing conditions that all the calculations have been made and the design carried out.

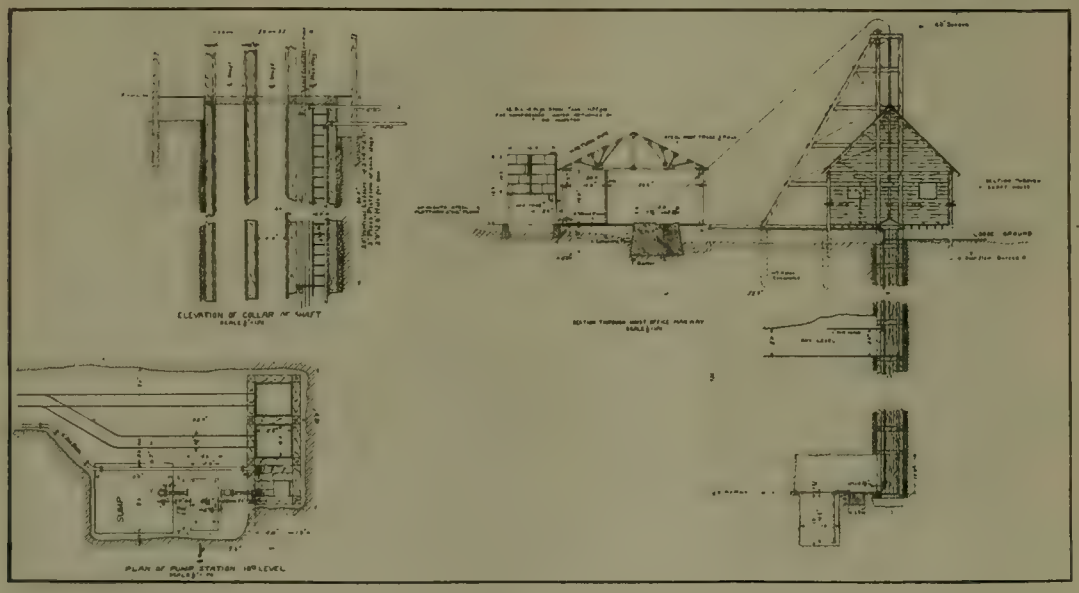


Fig. 1.

Pumping.—The tenth level is about the lowermost limit of the workable ore deposits, and therefore a sump is cut here, some little distance from the shaft (see Fig. 1). By so placing the sump, the pump can be piped to more advantage, diminishing the friction-head by eliminating sharp turns. An electrically-driven triplex pump capable of delivering 100 gal. per minute under a total head of 1000 ft. has been selected. Barometric pressure at this altitude is taken as 10 lb. per square inch, absolute, equivalent to 23.1 ft. of water. Practical suction lift = 80% of 23.1 ft. = 18.48 ft. from floor of tenth level; assumed suction lift = 12.6 ft.; lift from pump-floor to surface = 976 ft.; assume a 4-in. discharge pipe; then velocity of water $= \frac{134}{\frac{\pi}{4} \cdot \frac{1}{9}} = 153.5$ ft. per minute. Pipe friction at this velocity and size of pipe = 0.9 ft. of water per 100-ft. length of pipe, and for 1000 ft. of pipe = 9 ft. Total lift = 997.6 ft. Assume this to be 1000 ft. for all practical purposes.

Horse-power in-put to pump $= \frac{100 \cdot 8.33 \cdot 1000}{33{,}000 \cdot 0.8} = 31.6$

where 80% = combined efficiency of pump and motor; assume, as above, a triplex single-acting pump at 100-ft. piston speed per minute; one cylinder will have to handle $\frac{100}{3} = 33\frac{1}{3}$ gal. of water per minute; 33⅓ gal. = 4.45 cu. ft. of water per minute; allow 10% for leakage past valves and plunger; displacement $= \frac{4.45}{0.9} = 4.95$ cu. ft. per minute. Let r and d equal respectively the radius and diameter of plunger in inches, then $\pi r^2 \times 50 = 4.95$; $r = 0.1773$ ft.; $d = 4.25$ in. diameter of plunger; let the stroke be 7 in.; therefore select a 4 by 7-in. triplex single-acting pump. Under 100 gal. per minute at 1000-ft. head, a 4 by 7-in. pump requires a 35-hp. A. C. motor at 760 r.p.m. The pump is to be run at 88 r.p.m. Allowing 5% for line and transformer losses, this motor will require 36.8 hp. at the switchboard. The pump selected is illustrated in Fig. 2. The figures used are taken as the general averages in good use by designers of pumps.

The suction pipe of the pump is to be fitted with a plain cone-shaped strainer and to be of light-weight iron, 5 in. diam. The lower 500 ft. of discharge pipe to be of 4-in. special extra-heavy hydraulic flanged-

Mining and Scientific Press prize thesis, presented as part fulfilment of the requirements for graduation at the Colorado School of Mines, June 1910.

pipe, the next 225 ft. should be of medium weight, the upper 225 ft. to be of light weight flanged pipe; the pipe from shaft to overflow to be of ordinary screw joint, light weight, iron pipe. The pipe is to be brought down the manway (see Fig. 1) and to be tied to spreaders at every 5 ft. section. At the tenth level the pipe is to be carefully braced with a 12 by 12-in. block, and tied to timbers. The discharge at top is to be taken out of the shaft 4 ft. below the surface and run to some distance from the shaft. The water is useless, as it is muddy and slightly alkaline. Power is to be delivered to the motor at 440 volts, 60 cycles, 3 phase, through rubber-covered cables enclosed in a lead sheath, cable taken down manway and tied to timbers at each set.

Compressing.—It is proposed to use compressed air for drilling during a period of 16 hours, during two 8-hr. shifts; loading and shooting to be done during the remaining shift. Assuming that a $2\frac{1}{4}$-in. piston drill will break 10 tons of rock in an 8-hr. shift, it is found that the approximate number of drills required will be as follows: Rock to be broken per 16 hours = 225 tons; capacity of one $2\frac{1}{4}$-in. drill for 16 hours = 20 tons; number of $2\frac{1}{4}$-in. drills necessary, 11.25. These drills are to break all the rock to be hoisted in the mine; the waste broken by drills doing development to be used to fill open stopes. The $2\frac{1}{4}$-in. drills are equivalent to 68% of 3-in. drills, and hammer-drills to 36% of 3-in. drills. These two constants are based on the relative air consumption of the drills. The drills cannot be operated continuously, due to loss of time in setting up and changing steel. Hammer-drills require scarcely any time to set up and change steel, and therefore this consideration is not necessary. With the equivalent of a total of 8.3 three-inch drills in operation at one time, each requiring 125 cu. ft. of free air per minute at a pressure of 90 lb., a total of 1038 cu. ft. of free air (62° F. and 14.75 lb. pressure per square inch) is required at the drills, the operating pressure at the drills to be 90 lb. per square inch gauge.

The barometer at the mine reads approximately 20.40 in., equivalent to 10 lb. per square inch absolute pressure. This may be corrected for altitude as follows:

$$\frac{pv}{T} = \frac{p_1 v_1}{T_1}$$

where $T = T_1$ = average absolute temperature of air at the mine.

v = volume at sea level

v_1 = volume at mine

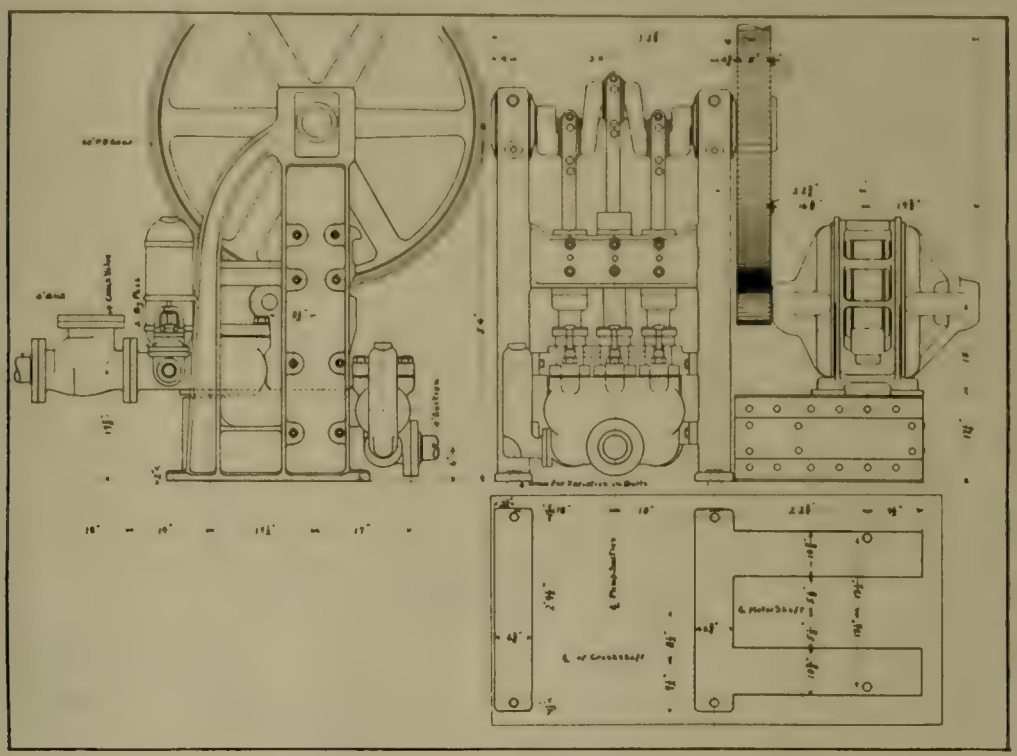


Fig. 2.

$p = 14.75$ lb. absolute.

$p_1 = 10$ lb. absolute.

$$v_1 = \frac{pv}{p_1} = \frac{14.75 \times 1038}{10} = 1525 \text{ cu. ft.}$$

To estimate the air required, allow 10% loss in transmission of air through pipes, then there will be required: $\frac{1525}{90} = 1698$ cu. ft. under atmospheric conditions at discharge valves of compressor. Allowing a loss of 5% for imperfect valve action and heating of incoming air, there will be required taken into the compressor per minute $\frac{1698}{95} = 1785$ cu. ft. under atmospheric conditions. To allow for loss of pressure in transmission it is considered that the final discharge pressure at the compressor is 95 lb. gauge. It is better therefore to select a two-stage machine. The absolute discharge pressure of the low-pressure cylinder will be: $p' = p_1 p_2 = 10 \times 105 = 32.4$ lb. absolute, where p_1 = atmospheric pressure absolute,

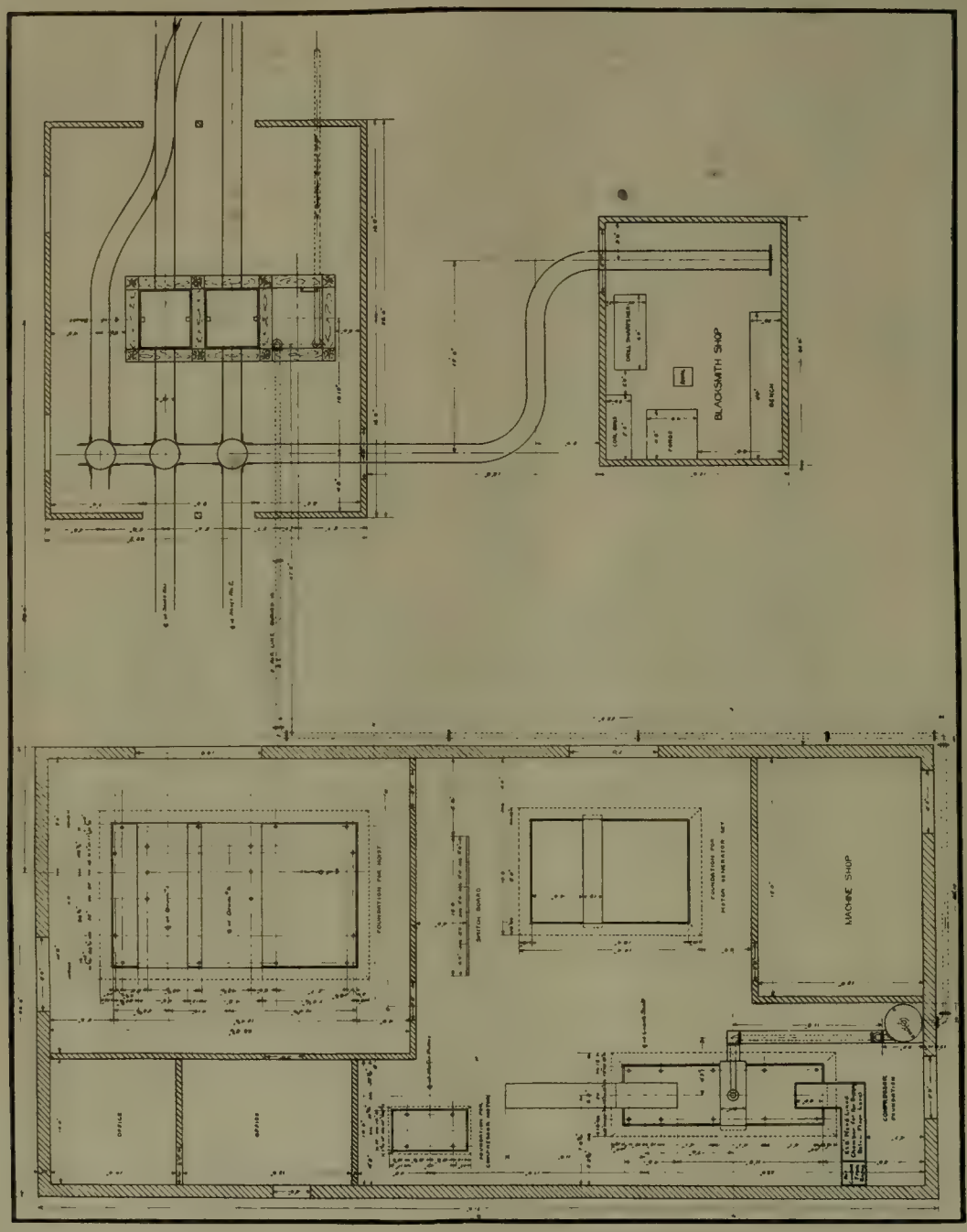


Fig. 3.

p_2 = final compressor pressure absolute. The assumption of complete cooling between stages and equal distribution of the work is made in above formula.

Assuming 2% clearance, the factor of clearance becomes,

$$F = 1 - \frac{2}{100}\left(\frac{32.2}{10}\right)^{0.712} + 0.02 = 0.974$$

The factor of clearance is equivalent to the ratio of the displacement of the piston to the total value of the cylinder. Then the displacement of the low-pressure cylinder is:

$$\frac{1785}{0.974} = 1832 \text{ cu. ft. per minute.}$$

Assume a 24-in. stroke with the compressor running at 150 r.p.m. Then the displacement per stroke of low-pressure cylinder is:

$$\frac{1832}{2 \times 150} = 6.106 \text{ cu. ft.}$$

and $\frac{6.106}{2} = 3.053$ sq. ft. = area low pressure cylinder. Diameter of low-pressure cylinder, approximately 24 in., and 13.4 in. diam. of high-pressure cylinder; indicated horse-power of air cylinders is 218. Allowing 77% for combined efficiency of motor and compressor,

$$\frac{218}{77} = 283 \text{ hp. required for motor.}$$

From the above data a belt-driven 2-stage compressor has been selected. The compressor is to be driven by a 440-volt, 60-cycle, 3-phase, 285-hp. in-

duction motor running at 600 r.p.m. with a driving pulley 30 in. diam. The belt is to be extra heavy double-ply leather 21 in. wide. This compressor is rated at 1885 cu. ft. free air per minute at 95 lb. gauge pressure, which corresponds closely with calculations.

The compressor is to be equipped with an unloading mechanism, especially applicable to motor-driven compressors, being completely unloaded at any radical change in speed. This allows the motor to come up to normal speed under no load. The control is operated by a centrifugal governor affected by speed alone. In conjunction with this there is a set of valves, called the "air control" operated by the air pressure of the receiver, which open or close the inlet valves in accordance with the demand for the air. Air should be supplied to the low-pressure cylinder at as low a temperature as possible to secure greatest efficiency. There is an increase in volumetric efficiency of 1% for every 5° F. reduction in temperature of entering air, below that of the engine room. To accomplish this, a wood conduit 2 by 2 ft. is led from the inlet valves of the compressor to a point under the eaves on the north side of the building, as shown in Fig. 3. Receivers are not so much for the purpose of storing the air, thus acting as a reservoir of energy, as to partly cool the air and free it from moisture before entering the main pipe-line, and to reduce the pulsating effect produced by the operation of the compressor. With these objects in view a 36-in. by 8-ft. upright receiver is to be erected as shown in Fig. 3. A second 30-in. by 5-ft. receiver is to be placed at the seventh level station to supply the seventh and eighth levels by means of suitable and separate 2-in. pipe-lines. A third 30-in. by 5-ft. receiver is to be placed near the pump station on the tenth level, supplying the ninth and tenth levels through 2-in. pipe-lines. The pipe, from compressor to receiver, is placed in a conduit, one foot square, in the cement floor; the floor at top of the conduit is recessed for receiving a cast-iron cover. From receiver to shaft the pipe is buried 18 in. underground. In the shaft the pipe is supported every 10 ft. From compressor to seventh level the pipe is 5 in. inside diameter; at this point a 4-in. branch line runs to the receiver and the main line, reduced to 4 in., extends to receiver on tenth level. All piping is to be standard weight, lap-welded mild steel, with flanges screwed on and supplied with suitable rubber gaskets.

Lighting and Shops.—The lighting of the plant and mine is to be done with 56-watt incandescent and 495-watt arc lights. A small transformer is used in connection with surface lights. The underground lighting, at stations only, is accomplished with incandescents. The current for station lighting is to be taken below in the cable for the pump motor and tapped off at each of the lower four levels, where a small line transformer will reduce the voltage to 110. Wires in buildings to be enclosed in ½-in., light-weight, galvanized iron pipe. All wires are to be rubber covered and joints carefully insulated. These lamps will require power as follows: 138 lamps, 56-watt = 7736 watts. 11 lamps, 395-watt = 5445 watts, making a total of 13,181 watts, or 13.18 kw. required by lamps at point of consumption. Allowing 5% for line loss = 14.87 kw. required at switchboard and 14.87 ÷ 1.41 = 18.09 hp. required at switchboard.

Shops.—The blacksmith shop is to be equipped with a 110-volt A. C. 5-hp. motor for operating drill sharpener and forge blower. This shop is to be built of brick; see Fig. 3; roof to be of corrugated iron on light steel frame. The foundations are to be of masonry and to extend 2 ft. 6 in. below surface; floor to be either earth packed hard, or 4 in. concrete and cement. The machine shop, Fig. 3, is to be equipped with a small lathe and drill press operated by a 7.5 hp., 110 volt, A. C. motor.

Ore-Bins.—The bins are to be placed on the side of the ridge so that ore can be run directly into the standard-gauge cars on the railroad, and to have a ten-days storage capacity, or 750 tons of ore, equivalent to 7500 cu. ft., assuming that a ton of broken ore occupies 10 cu. ft. The shape of the bins is to be that of a right-angle triangle, with one leg horizontal and the other vertical. The bins are to be made of two layers of 2 by 12-in. planks supported by 12 by 12-in. timbers. The house, or covering, is to be of 1 by 12-in. boards with sloping shingled roof. The eaves to be 8 ft. above the feed track. The uprights and supports for the house are to be of 6 by 6-in. timbers securely imbedded in concrete piers. All upright timbers are to be securely imbedded in concrete piers. The roof is to slope at approximately 45°, on account of the heavy snowfall. The bins are to be discharged by steel doors operated from the outside. This building is to be lighted and equipped with eight windows, three on a side and one at each end. The ore-house door is to be made of sliding construction, 7 ft. wide by 7 ft. high.

Fire Protection.—The plant is to be equipped with 25 fire extinguishers, these to be distributed in the buildings and on the four lower levels of the mine. The water-tank for the compressor is to be attached to an air-injector and garden hose for emergencies. The column-pipe for the pump discharge is to have a nozzle attached at each of the levels of the mine for fire protection at the stations. The shaft-house is to be equipped with not less than three axes and three saws, to be used only in case of fire.

(To Be Continued.)

Old timbers should not be left in a mine when they can be removed. It is cheaper in the end to remove them to the surface where they may be dried and burned. If left in the mine sound timber may be infected from the old, and decay results in the formation of carbon dioxide which contaminates the air and also throws out heat. Many old abandoned stopes give practical evidence of this.

Dividing the bin beneath the station at a mine shaft into two compartments, one for waste and the other for ore, is ordinarily easy. It simply requires the secure placing of a few stout timbers to which planks can be firmly spiked. Where space is available this is a ready means of handling both waste and ore.

Concentration of Slime—II

By Edwin A. Sperry

(Continued From Page 177)

It is interesting to note some of the results accomplished by the use of the Callow screen, in actual mill work, as given by Mr. Callow. In one case, two screens 4 ft. by 24 in. were installed, screening to 40 and 100-mesh, respectively. The first screen (40 mesh) takes the undersize from a 6-mesh, 22 wire (0.137 in. or 3.5-mm. open space) trommel, and handles 150 tons per 24 hours, or 6.25 tons per inch of belt width. The life of the belt in this case is 35 days. The second screen (100-mesh) handles the undersize from the first screen, amounting to about 30 tons in 24 hours. The life of this belt is upward of three months. The oversize from the first screen goes to two jigs. Formerly three jigs were used to handle this product. The oversize from the 100-mesh goes to one Wilfley table, where four tables were formerly used, and the undersize from the 100-mesh goes to four Wilfley tables. The muddy water from these last Wilfley tables is settled, dewatered, and treated on vanners. The final results show a great reduction in value of the tailing. The jig tailing is reduced from 0.6 to 0.3%, and the Wilfley tailing from 1.3 to 0.35%. Several similar cases might be cited. This improvement in results is probably largely due to the increased thoroughness of the sizing and may be cited as a practical illustration of its great importance. The cleanness of the work has been shown in tests which have come to my notice, one being on an ore especially difficult to screen, which showed less than 4% of undersize remaining on the screen. In that the pulp is quiescent on the screen, the production of slime is slight in comparison with any screen in which agitation, shaking, or rolling is employed.

The action of the King screen is similar to the Callow, with the exception that a slight rolling motion is given to the ore. In cross-section it is hexagonal, the sides being curved opposite the circumscribing circle. A spray pipe is placed directly over the centre of the screen, on the outside, the purpose of which is to wash the pulp as it passes beneath it. The undersize material passes through the screen into its proper launder, while the oversize is discharged over the edge into its hopper. There are sprays placed inside the screen below its centre which clean the screen of particles which may be lodged in the meshes. The slight rolling motion given the pulp seems to aid in the washing action without material injury to the screen. In one instance this screen was in constant operation for over four months without appreciable wear to the screen cloth. In this case, 100-mesh screen cloth was used on 30-mesh pulp, there being less than 4% of undersize remaining in the oversize. The same advantage in the matter of reduction of slime may be credited to the King screen as to the Callow, though in less degree, owing to the slight rolling motion already mentioned, but this can hardly be considered as material, as the action is slight, both in amplitude and time. The life of the screen appears to be somewhat longer than that of the Callow, the reason for which is probably in the fact that it is not subject to a continued bending as is the case in the Callow. The rolling action in the King may, however, offset this when comparisons are made in long continued operation. The capacities and efficiencies of the two forms seem to be nearly identical, and while the King screen has some advantage in the matter of weight and floor space, the Callow requires less height, which in some cases is of importance. In comparative work between the King screen and the trommel, and extending through several months, the proportion of slime produced in one mill, separating lead and zinc, was 20% for the trommels as against 12% for the King. These results were probably due, in part, at least, to the prompt and thorough isolation of the undersize by which only a slight proportion was returned to the crushing machines. It can be stated certainly, that in the development of this type of screen, as exemplified in both the Callow and King, a great advance has been made in the solution of the problem of sizing as regards 'fine' and 'slime' work, and several forms based on similar action have been recently introduced with satisfactory results.

CLASSIFICATION

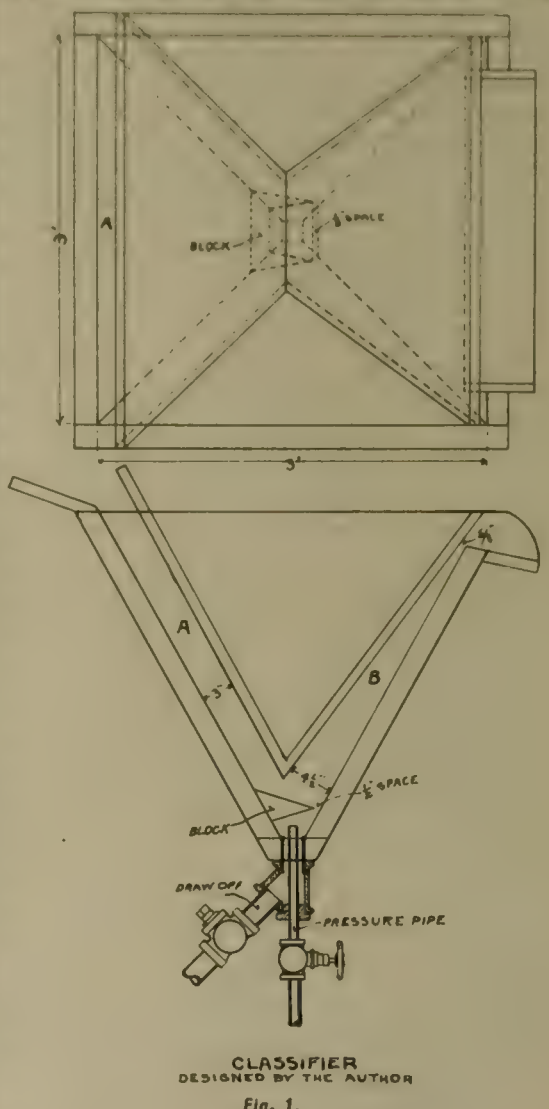
Classification is sometimes confused with sizing, but they are based on diametrically opposite principles. A few comparisons will serve to more definitely fix the difference in mind. As previously stated sizing is the separation of ore particles into classes having the same diameter, within a certain range, regardless of their specific gravity. Classification is just reversed—it is the separation of ore particles into classes having the same settling velocity in water, within certain limits, regardless of their diameter. It is based entirely on the speed of settling which is directly influenced by specific gravity. An extended discussion on the sizes of equal-settling particles will not be attempted, but it will be sufficient to mention one comparison—quartz and galena. A particle of galena has about the same settling velocity as a particle of quartz approximately four times its size. From this it will be seen that there is a wide variation in the sizes that would be drawn off together. In concentration sizing is of great importance and without it the treatment of the ore is rendered most difficult. As a result of classification the ore particles show extremely wide variations in the matter of size, as has been shown, far exceeding the range of sizes which, it would seem reasonable to believe, would give the best results. There is much discussion on this point, with honest advocates on both sides. One point held is that, as the quartz particle is so much larger than the galena, it extends farther up into the flow of water and is more readily rolled. If the action of carrying off the quartz particles were that of rolling this might be considered important, but as the ore is stratified before any elimination of quartz takes place, the latter must necessarily rest on the stratum of metallic particles. If, then, the quartz particle is rolled it is more than apt (and, in fact, this condi-

tion has been met and noted to cut a channel in the mineral stratum and by thus disturbing it afford the mineral an opportunity to pass off with the quartz. As a matter of fact the quartz particles should move off as a body gently and in passing over the mineral should not have sufficient weight to disturb the mineral stratum.

These arguments refer entirely to sizes larger than 100-mesh .48 wire material, as the use of classification on sizes finer than this is not often advantageous. In these sizes the above objections cease to be serious. This is due to the fact that when these extremely small sizes are reached, the behavior of all the particles, either quartz or mineral, is similar. This is one of the reasons why the treatment of slime is difficult. While it has been stated as a fundamental fact that hydraulic-classification is theoretically imperfect, still it must be conceded that, beyond a certain point, the ability to size by screen is impracticable if not impossible. From this point, taken for the sake of argument at 100-mesh, .38 wire and finer, the practice must of necessity be hydraulic classification. As to the form of the appliance best fitted to do this work there is room for discussion. In the use of hydraulic classifiers in the form of the 'cone sizer,' as it is termed, there is ordinarily excessive use of wash water. In this addition of water two serious results are brought about, one being the extra demand for water, and the other, the dilution of the pulp to such an extent as to cause trouble in its subsequent preparation for final treatment. In some cases the dilution of the pulp has extended to a 4% solid consistence. Now, when it is taken into consideration that slime pulp should be delivered to the table for final treatment at not less than 15% solid consistence, for some classes of machines, and as high as 25 or 30% for others, it can be readily seen how serious dilution may become. It has been stated, and is still maintained, that in some cases, sizing to 100-mesh is considered close enough in practical operations. There are cases, however, where there is a great advantage in isolating material which more nearly approaches the condition of slime, as indicated in the second definition given. One case which can be cited is that of a tailing which was being treated for the extraction of lead in an extremely fine state. It was found by experiment that practically all the recoverable mineral was extracted from material coarser than 200-mesh, .45 wire, and in order to obtain the best results the minus 200-mesh had to be isolated. For several reasons it would have been futile, if not disastrous, to attempt to make this separation by the use of the ordinary cone classifier. The additional water would have been prohibitive of good results in the final treatment, and it would have been impossible to divert a portion of the fine mineral particles into their proper channel as well as was done by the method employed.

Many forms of classifiers have been devised which, in most instances, can be placed in one of four types: (1) the cone-sizer; (2) the spitzkasten; (3) the spitzlutte; (4) the sizing-launder. In some cases it might be hard to typify a machine in which a combination of the several types is employed. There are two general methods of applying the principles on which hydraulic classification is based, one being by the use of a rising and the other by means of a horizontal current.

The first type, the cone-sizer, using a rising current and clear water jet, while being the one most commonly employed, has in my judgment the least to recommend it. The quantity of water necessary



CLASSIFIER
DESIGNED BY THE AUTHOR

Fig. 1.

for its operation is excessive, adding materially to that already in the slime, which certainly should be avoided, while the liability of choking is great, and necessitates constant watching. A simple form of classifier is shown in the accompanying cut, Fig. 1. This classifier was designed to remove the muddy water from material being fed to a 10-mesh jig. The main idea was to change the flow from a rapidly increasing downward current to a uniform up-current, and at the same time to pass by, rather than to feed toward, the aperture leading to the draw-off. In this way the up-current would not have to overcome the down motion of the particle, and if its specific gravity were sufficient, it would overcome the rising current naturally and of its own weight.

As the pulp passes down at A, it increases its speed as it approaches the lower point of the classifier, and as it strikes the 'block' shown, it is deflected quickly into the channel, B, which is so designed that it has a uniform sectional area at all points along its entire length. As the pulp passes through the constricted area immediately above the 'block' it is thrown up into the uniform current for some distance, and if the speed of the current is not rapid enough to carry it along to the discharge it will fall onto the lower wall of the channel, B, and pass down through the ½-in. slot between the 'block' and this wall, into the discharging chamber below. In the meantime the water from the pressure pipe impinges on the bottom of the 'block,' and distributing, passes up quite uniformly through the ½-in. space and washes the muddy water from the draw-off material. It was found that by its use classification was excellent and the feed on the jig was clean. It is certainly cheap and simple, and a carpenter can make one easily in a day.

The second type, using a horizontal current, has much to recommend it. This type, as stated, is exemplified in the spitzkasten. In this form, not only is the excessive use of water avoided, but much clear water is recovered, thus increasing the available water supply. Again, the pulp as drawn off is properly prepared for treatment on the various machines designed for treating the different sizes, especially the slime. It cannot be denied that there is a tendency toward choking, but as the depth of water in the spitzkasten is greater than in the cone-sizer, this can be more readily avoided. It can also be done by attaching a pressure or service pipe to the draw-off spout. By turning it on when necessary the clog can be broken. This pressure pipe is not so readily applied to the cone-sizer, as it is already employed in its regular operation. In one instance in my experience, which will be dealt with in detail under the head of 'Dewatering,' the classification in a spitzkasten, 8 by 10 by 30 ft., was almost perfectly done, grading regularly down in each of the four compartments, from 60-mesh in the first to 200-mesh in the last.

The third type, the spitzlutte, is made in the form of a V-shaped trough with the course of the flow transversely. A similarly-shaped, vertically-sliding trough is inserted in such a manner as to form an oblong channel bent at the middle. The sectional area of the channel is uniform at all points. This gives a down and an up flow at practically the same speed, the clear-water jet at the apex, compensating for the draw-off of the coarse material.

In the sizing-launder there is a resemblance to the spitzkasten much reduced in size. Several forms have come to my notice, some using enlarged sections with hoppers and clear-water jets, and some longitudinal slots in the bottom at intervals along its length. The simplest and most effective of those noted is the form constructed and used by Frank Bosco, in the Grand Mogul mill, at Gladstone, Colorado. Its normal form was in the shape of a V. At intervals the form was changed to that of a square-box launder for a distance of 2 ft. In this portion, a longitudinal slot was cut in the bottom along the centre line. The tendency of the coarse material was to collect at the apex of the V-shaped section, and as it debouched into the widened section this coarse material was delivered directly to the slot, and, passing down through it, was collected in a hopper attached to the launder and conveyed to its proper destination. Its operation and results were satisfactory.

DEWATERING

While proper sizing is certainly an important step in the preparation of slime for treatment, settling and dewatering has probably more influence on the final result than any other step in the process. This is more readily and easily accomplished by the use of properly shaped settling tanks, more especially the spitzkasten. This appliance is a V-shaped tank, ordinarily 24 or 30 ft. long, 8 ft. high, and 10 ft. wide, the sides being brought together at the bottom. It is generally divided into sections by the use of sloping divisions usually 3 ft. high, so built as to form hoppers at the bottom. These sections are 6 ft. long and have draw-off holes at the apices. The flow from them is regulated by inserting plugs having holes bored through the centre and attached to long rods to be manipulated from above the tank. A series of plugs having different sized holes is made so that by the proper selection, the draw off may be larger or smaller. A fuller description of the spitzkasten will be given later. There is one principle in the treatment of slime by concentration that is so often lost sight of by men who have been considered capable in their line. This is the matter of the absolute necessity of a thoroughly gentle method of coaxing, instead of a violent method of attempting to force, the particles to do the will of the operator. The slime particle is a wilful and elusive little fellow, and the old saying that 'you can catch more flies with sugar than with vinegar,' will certainly obtain in this case. It is better by far to let the particle seem to have his own way and then, after that way has been carefully studied and learned, to adopt such methods as will meet his wilfulness and set a trap for him into which he will naturally fall of his own accord.

The principle briefly stated is: in all operations connected with the handling of slime the utmost importance must be given to the avoidance of currents or agitation. The sooner this fundamental principle is fully understood and its full value appreciated, the sooner will the problem of the concentration of slime be simplified. This applies to all devices, as well as to the so-called improvements on otherwise efficient appliances in which, or by which, any kind of agitation, restriction of flow, disturbances, or currents of any kind are created. Among these can be classed the so-called 'baffle boards,' which are supposed to throw the particles down to the bottom of a settling device of any kind. Also, the form of spitzkasten which, being composed of a series of inverted pyramids, have the overflow from one to the other at or near the surface. Another is the 'over and under' settling tank containing partitions which are set alternately above and below through constricted sections.

There is another method of handling slime which I can freely say has little to recommend it. That is the use of the "canvas plants." I will assert without fear of contravention that in comparison with the settling method it is far inferior. In practical demonstrations, the saving of mineral has ranged from 40 to 50% for the canvas as against 60 to 80 for the settling method. This is borne out by actual test and experiment. In one particular case which came under my observation, there were 180 tons of ore crushed every 24 hours. Rolls were used. The mill tailing was screened on 20-mesh shaking screens. The undersize was further sized by the use of large settling tanks, the overflow from which was approximately 60 mesh or finer. This product amounted to 65 tons in 24 hours. Of this amount, 13.16 tons was caught on the canvas, and 51.84 tons was wasted. Taking lead as a basis of calculation, the average value of the 65 tons was 4.7%. The product from the canvas plant to be re-treated or cleaned was 20.2% of the total by weight, and averaged 12.1% Pb, containing 51.6% of the total lead. Of this lead 95% passed a 200-mesh screen, representing 49% of the total. The minus 200-mesh size of this product was 50% in quantity, and ran 23.2 Pb. The tailing or waste from the canvas plant was 79.8% of the total in weight, and ran 2.9 Pb, containing 48.4% of the total lead, 86.2% of which passed 200-mesh, representing 41.7% of total lead. The minus 200-mesh of this was 60.5% in weight, and ran 4.1 Pb. It can be clearly seen that 90.7% of the total lead in the pulp fed to the canvas would pass 200-mesh, 45.9% of which was lost as tailing from the canvas plant. The product for re-treatment was subsequently run over a slime table, with a saving of 84%. It is fair to suppose that had the entire tailing been properly sized and prepared, at least 80% of the total lead could have been delivered to slime machines, and that on the same basis 67.2% of the total could have been recovered instead of 43.3, as was the case.

In direct comparison the case of another mill using a large spitzkasten for preparing the slime pulp may be cited. This mill was treating a somewhat similar ore, but crushing to 60-mesh. All tailing, amounting to 80 tons, was run into a spitzkasten 30 by 10 by 8 ft., having five compartments. The first four drawings were made for experiment, and to determine the value in the products. The average value of these four combined was 0.5% lead and the weight was 55 tons. The fifth draw off, of 25 tons, ran 5% lead, and would all pass 200-mesh. The overflow water was perfectly clear, and while it must be admitted that some valuable slime was held in suspension, the amount was conspicuously small when compared with losses from canvas tables. Thus it will be seen that 82% of the value was retained in a product ready for treatment on the slime concentrators, while the product from the canvas plant contained but 51.6% of the value, and was not in proper condition for economical treatment, as it was necessary to rehandle it. After dewatering in the spitzkasten, a subsequent saving was made on the slime tables of about 80% of the lead in the pulp fed to them, or about 66% of the total lead.

Another point worthy of consideration is the possibility of re-using the clear water from the overflow of the spitzkasten for the purpose of washing in subsequent treatment, thus economizing in the use of water which in many cases is important. Many other cases could be cited. They would be parallel in results and conclusions, so these are used as typical. In the use of the spitzkasten there is a series of operations carried on contemporaneously, all of which tend to the advancement of the work in hand. These operations are sizing or classification, dewatering and partial concentration. A sketch of one similar to that used at the mill referred to is shown. See Fig. 2. The sizing in this case was nearly perfect, ranging from 60-mesh to 200-mesh in regularly decreasing sizes, merging, of course, from one into the other. The ultimate object was, however, attained the separation of the 200-mesh material which, of

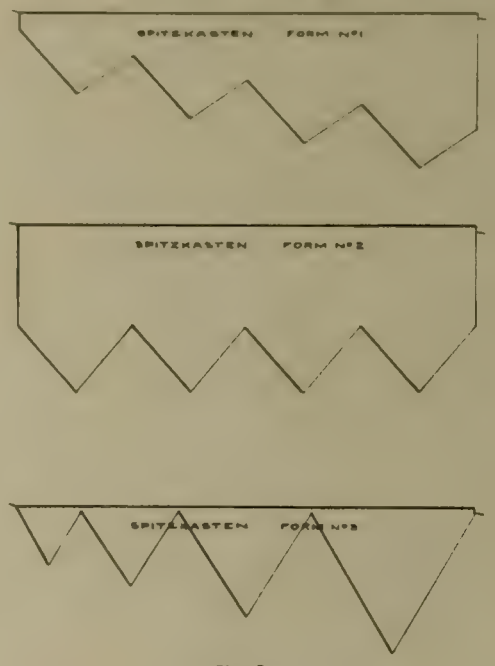


Fig. 2.

itself, carried such a large proportion of the escaping mineral. The consistence of the products from each draw-off was easily regulated by use of plugs and goose-necks, so that pulp was dewatered to any desired proportion of solids. The discharge was automatic, continuous, and regular, affording the best of conditions for proper subsequent treatment. It is obvious that by recovering the 200-mesh material in one product, since the bulk of the value is in this, a partial concentration was accomplished.

It has been stated that any current causes losses of slime. While this may be strictly true, there is a certain settling action in the slow movement of water in a body, which can be employed to advantage. This statement is based on observations made in several cases. For instance, a portion of the pulp at one mill was placed in a closed bottle and shaken thoroughly. At the end of 12 hours the pulp had but imperfectly settled, the water still being cloudy. The pulp stream from which this sample was taken was regularly delivered into the spitzkasten. The volume

of this stream was sufficient to fill the entire spitzkasten in about one hour, thus giving a current of 2 ft. per min. in a body having 35 sq. ft. of area. The water from the overflow was clearer than the supernatant water in the bottle, and still had but one hour for settling. A simple cause to which this may be attributed seems to be that in its slow motion the relation of water particles is continually changing, the more readily allowing the mineral particles to assert their superior gravity, while in a quiescent state the mineral particles become, in a way, lodged. Electric action has been suggested as a possible cause.

There are several forms of the spitzkasten, the various differences in form being due to difference in personal opinion. They all, however, have a general resemblance. Sketches of three forms are given. Fig. 2. These cover the ground in the order of their comparative theoretical effectiveness.

The first, form 1, is constructed with an increasing width and depth, allowing a gradually decreasing speed of current. As a result the settling tendency increases, and, as the cross-section of the flow is small at the beginning, the finer portions will be carried ahead the more readily to the compartment beyond, where it is designed they should settle. This form can be so designed that the cross-section progressively varies in such manner as to rapidly increase as the current passes beyond each of the divisions, giving a correspondingly decreasing speed, and as the pulp passes the apex or point of the hopper from which the draw-off is made, it has attained its minimum speed. From this point there is a practically uniform area of cross-section, to a point near the next division. It then decreases in area, slightly increasing the flow for a short distance, but the moment it passes this ridge the area increases rapidly as before to the point of the hopper, repeating this at every successive section with a decreased speed in each instance. The advantage of this action is obvious, and is clearly demonstrated in the figure showing this form of spitzkasten. (Fig. 2.)

The form 2 shown, is efficient and it was on a spitzkasten of this form that I made most of my observations as to action and effect. In this form it will be seen that the progressive sectional areas are increased and decreased in a series of identical fluctuations at each one of the sections, but there are two things which seem to assist in the classification and final settlement. One of these is that a portion of the content is drawn off at each successive spigot, and by just so much is the speed of the flow retarded. Another is that, in the matter of the finest of the material, the settling action is so slow as to hardly reach deep enough to be affected by the separating ridges until the pulp has traveled a considerable distance from the initial or feed end. Above the dividing ridges, is what might be called the effective sectional area of the moving body of water. Its sectional area in this case was 34⅓ ft. or about 86% of the total area figured to the apex. The spaces between the partitions can be said to contain practically dead water and consequently cannot be figured as effective, merely acting as a body in which the particles that are carried to it are at rest.

In the operation of this spitzkasten it was found that, when running normally, the water of the overflow end was, what might be called perfectly clear for a depth of about 14 in. from the surface. As the overflow was shallow and broad, the effect was that of drawing off from the surface without agitation. In this way the slime pulp was kept quiescent. In case any material is floating, and it is necessary to prevent this from going out with the overflow, a very shallow baffle-board could be placed across the spitzkasten near the lower end, but it should not extend down into the body of water enough to cause any disturbance to the pulp.

The third, form 3, resembles the first in appearance only. It is composed of a series of independent inverted pyramids, the divisions between them being extended nearly to the top of the spitzkasten.

It would need no special argument or discussion to show the faulty action in this form, and reference need only be made to the fact that what work may have been started in the first compartments in the way of settlement of the finer material is entirely defeated as the pulp is brought back to the surface and passes over each successive dividing partition. In this way the work has to be started all over again as each partition is passed, and effective settling is only done in last compartment. To the classifying action there would probably be less objection, but it can hardly be proved superior in this regard to the first form.

A new form of spitzkasten has been recently invented and patented by C. L. Buckingham, of Denver, which has some interesting features. The principal departure from the regular form is on the application of burlap screens in such a manner as completely to arrest the movement of the slime and to strain the overflow water. The entire top is covered with strainers and, as the head of the feed water is slightly higher than the plane of these, the water is gently forced up through. In addition to these strainers, others are placed underneath them in a sloping position, the action being to clarify the water to a great extent before it reaches the upper ones. It is a well-established fact that if any woolly, or coarse-woven fabric, such as burlap, is placed across the flow of water carrying slime, the minutest particles will attach themselves to the little filaments, and in time form a spongy porous mass which acts perfectly as a filter. This action would evidently take place on these screens, and experiment seems to prove that it does in this case. The arrest of the slime material is said to be complete, and on gaining sufficient weight it drops off, is carried ahead, and drawn off at the proper point. Draw-off cocks are placed at intervals and the pulp is taken from them at any desired solid consistence, as in the regular form. Another claim, which seems to be well founded, is the possibility of making a thorough classification.

When only settling and dewatering without classification is desired, simple conical or pyramidal tanks are often used. It is customary in such cases to feed at the centre of the tank, using the entire periphery for discharge of clear water, drawing off the thickened pulp at the apex. The Callow tank may

be cited as an excellent example of this class. This tank is conical, having a height of 7 ft. 7 in. and an effective width at the top of 8 ft. I have found it possible to settle about 20 gal. per min. with this. The amount of solid material possible to handle in tank of this kind depends consequently on the consistence of the material fed into it. For instance, if the feed to the tank should be 10% solids, from 20 to 25 tons per 24 hours could be readily handled and properly prepared. In cases where from the use of hydraulic classifiers for instance, the consistence of the pulp should be as low as 4% solids which has been met with in actual experience the efficient capacity is materially reduced. In the use of the conical settling tanks the point giving the greatest amount of trouble is the tendency or liability to choke at the apex. This is due to the fact that everything of a solid character has to pass out through the opening at the point where everything is bound to settle. Avoidance of this trouble has been attempted in several ways, principally by the use of a system of pipes carrying a high water-pressure, by which the clogging material is forced back into the tank. This is at best only temporary, and when the pressure is removed the same condition is liable to recur.

A form of draw-off might be suggested for consideration that has been applied in some cases, though no statement of actual results is available. In this form there is an auxiliary chamber attached to the side of the tank that is in the form of a long tube having an opening into the tank for almost its entire length. The lower end is closed. At the upper is placed a gland through which is inserted a pipe, the lower end of which reaches nearly to the lower end of the auxiliary chamber. This pipe is used as the draw-off acting in the place of the ordinary goose-neck. In this manner the initial point of draw-off is removed a little distance from the apex. In case there is a clogging of the draw-off pipe, it is only necessary to withdraw the pipe sufficiently to reach a point where the thinness of the pulp will insure a free flow, thus immediately re-starting the action of the tank. The pipe is then gradually returned to its original position, thereby cutting out the thick pulp that may have collected. Any foreign obstacle is more than likely to settle into the apex itself at some distance from the point of draw-off. The hose connected to the upper end of the pipe can rest on a roller or convenient support, so that in withdrawing the pipe the established height of the goose-neck will remain constant. A pressure pipe may be applied if considered necessary.

The Geological Survey has made field and laboratory studies of many kinds of sands and gravels in localities where Federal buildings are in course of construction. These studies have shown great differences in the quality of sand and gravel used at different places for making concrete. Some contractors contend that run-of-bank sand and gravel is the best for making cement concrete, but this contention is generally not sustained by practical trials and experiments. The most desirable material is that which is free from clay, loam, or dust.

EXPLOSIVES FOR TUNNEL DRIVING

Selection of explosives for tunnel blasting probably requires a more careful study of conditions than for any other kind of excavating. Maximum speed in driving cannot be attained unless the explosive best adapted to the work be used. When starting a tunnel or drift it is a good plan thoroughly to try several explosives which differ in action before finally adopting any one. The results, however from this preliminary trial will be of little or no value unless each explosive is used under exactly the same conditions. Care must be taken to allow for change in the character of the rock, number and direction of the bore holes, strength of the detonator, kind and quantity of tamping, amount of water, and method of connecting the bore-holes for firing. If possible, these conditions should be uniform throughout the test. If a material change in any of them does occur as the work progresses, further tests should be made to determine whether a quicker or slower, a stronger or weaker, explosive might not break the ground or bottom the bore-holes better, or make it possible to bring out the cut with fewer holes or deeper ones. The speed at which rock can be drilled does not indicate how it will break, and not infrequently that which can be easily drilled is very difficult to blast.

High explosives suitable for tunnel blasting should not give off objectionable fumes on detonation, and accordingly gelatin dynamite, blasting gelatin, or ammonia dynamite are recommended. Gelatin dynamite is made in various grades of strength, from 25 to 80%, inclusive. It is comparatively slow in action, the higher grades being little, if any, quicker than the lower ones. Blasting gelatin is manufactured in only one strength, which for comparative purposes may be said to be 100%. It is more powerful and quicker acting than any other blasting explosive. It should be used sparingly, therefore, until the maximum safe charge has been learned from experience. Good results will often be had in hard ground if a few cartridges of blasting gelatin are used in the point of the bore-hole, with gelatin dynamite on top. When this is done it is best to put the detonator in one of the cartridges of blasting gelatin. Ammonia dynamite is made from 25 to 75% strength. All grades are quicker than gelatin dynamites, and generally speaking the quickness increases with the strength. That is, the stronger grades are quicker and the lower grades slower in action. The various grades of these three high explosives offer a wide range in strength and quickness from which to select.

Railroad tunnels, mine tunnels, and drifts, highway tunnels, and irrigation tunnels are being driven daily through various kinds of 'ground.' Often it is a matter of first importance to finish them quickly, and consequently details in regard to methods and equipment are matters of general interest. No matter what explosive is used in blasting, maximum results can only be attained by always having the explosive in a thoroughly thawed condition when it is used, by tamping firmly with earth, from the charge of explosives to the mouth of the bore-hole, and by using the strongest detonator that can be secured.

Iron Ores Near Dayton, Nevada

By E. C. Harder

*Dayton is a small village in eastern Lyon county, Nevada, on the Carson & Colorado branch of the Southern Pacific railroad. The village is on Carson river at the upper (southwest) end of a broad flat desert, just below the point where the river runs out of the canyon below and east of Carson. Two groups of iron-ore deposits are found near Dayton—a small one about two miles to the southwest, between the railroad and the river, and a large one about twelve miles to the northeast, on the boundary of Lyon and Storey counties. Only the latter is of commercial importance in the steel industry, but the ore from the former might be used in a small way as fluxing material.

The deposits northeast of Dayton are in an area of gently rolling hills which form the northeastern continuation of the flat desert area below Dayton. Northeast of the deposits there is another desert area with alkali flats, and beyond are other rolling hills. This generally low belt bounded on the northwest and southeast by mountain ranges is known as the Fortymile desert. In the mountains to the northeast is the famous old Comstock Lode, with Virginia City and Gold Hill high up on the slope. The iron-ore deposits are near the northwest border of the desert belt. Outcrops of ore are distributed over an area roughly one-fourth of a mile wide and half a mile long, the longer diameter being approximately north and south. At the south end of the area there is a hill rising about 75 or 100 ft. above the surrounding area. Its crest is about 900 ft. long and 200 wide and trends about N. 45° W. Iron-ore outcrops form the crest and extend some distance down the slope. From the distribution of ore and rock as shown by outcrops and pits it appears probable that the area is underlain largely by soda granite, in part aplite, in which there are local masses of limestone and iron ore. Where the relation of the ore to the rocks is clear it is seen that the ore occurs at the contact of the limestone and granite. The soda granite has also broken into the limestone and ore masses in irregular intrusions. Metamorphic minerals, including garnet and epidote with a little albite, are developed locally.

The outcrops of ore on the hill at the south end of the iron-ore area occupy a space about 1000 ft. long and from 200 to 500 wide. Within this area there are one or two tongues of granite and the float between the outcrops may cover limestone or other granite bodies. The surface ore on the crest is hard and massive, though slightly porous in places. One shaft and several pits have been sunk into it. The pits have not passed through the hard ore, but the shaft goes into a soft, bluish, granular mixture of magnetite and calcite at a depth of less than 20 ft.

On the northwest slope of the hill some porous, hard, low-grade ore, with considerable impurities consisting largely of unreplaced silicious rock, outcrops on the lower slope, but most of the ore outcropping on the upper slope is hard and massive, though mixed irregularly with it is the blue granular ore already mentioned.

From their occurrence the ores northeast of Dayton appear to be contact deposits formed during or after the intrusion of the granite into the limestone. This view is strengthened by the presence of minerals characteristic of intrusive contacts. The ores are probably partial replacements of the limestone, some of the original limestone being still present as local masses in the vicinity of the ore or occuring in the recrystallized form of calcite within the ore. The surface ore has been enriched and concentrated by the removal of calcite and probably by the deposition of iron oxides. The selenite may be simply a deposit near the surface from gypsiferous solutions or the sulphur in it may have been derived from the oxidation of pyrite.

From the distribution of ore and rock as shown by outcrops and pits it appears probable that the area is underlain largely by soda granite, in part aplite, in which there are local masses of limestone and iron ore. Where the relation of the ore to the rocks is clear it is seen that the ore occurs at the contact of the limestone and granite. The soda granite has also broken into the limestone and ore masses in irregular intrusions. Metamorphic minerals, including garnet and epidote with a little albite, are developed locally.

Most of the surface ore is of high grade. In depth it appears, whenever penetrated, to be strongly impregnated with calcite. Locally enough calcite is present to make the ore self-fluxing, and therefore in reality the presence of calcite does not materially affect the value of the ore. The selenite may be abundant enough in places to necessitate dressing of the ore to reduce the sulphur content. If the ores were smelted in the electric furnace, however, the presence of selenite would not be objectionable. The depth to which the ores may extend is problematic, though the increasing amount of calcite with increasing depth suggests that the ore may become of too low grade to be worked. But the deposits are of sufficient size to be commercially important even if the ore is supposed to be relatively shallow. With a depth of 50 ft. the deposit on the hill at the south end of the area would probably yield approximately 1,500,000 tons of ore. The deposits are on low ground and can easily be approached by a railroad. Veins of iron ore also occur in a dark-green fine-grained andesite on the east slope of a ridge about two miles southwest of Dayton.

*Abstract from Bull. 430 E, U. S. Geol. Survey.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than careful compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

A Cyanide Problem

The Editor:

Sir—There are many contributions to the technical press dealing with the cyaniding of gold and silver ores, and numerous books on the subject, all of which give valuable data, metallurgical, mechanical, and economic, but there are still phases of the treatment of certain refractory ores which none of these authors mention, or, if they do, in only a casual manner, throwing little light upon vexed questions. I have in mind an ore consisting of a quartz gangue in which occurs pyrite in abundance, with a relatively small amount of galena, blende, and chalcopyrite. The value is chiefly in gold, which to some extent is free, that is, it may be panned, but accompanying it is silver, which mostly occurs as a complex antimonial compound. This ore has thus far successfully resisted all efforts to treat it either by amalgamation or cyanidation, the tailing still carrying nearly half of the original value of the ore. If some one of the numerous contributors to the extensive literature of the cyanide process would tell how the antimony in this ore may be eliminated, or at least rendered innocuous, it would be appreciated by many having mines producing ores of similar character. It is quite possible that roasting before cyanidation, or roasting in connection with the chlorination process, would solve the problem, but the additional cost of handling and roasting in a region where fuel of any kind is far from abundant makes the treatment of the raw ore desirable, if not necessary, for reasons of economy. Then, too, it is not always an easy matter to secure the services of an expert roaster, such as would be imperative in the handling of an antimonial ore. Arsenic is bad enough, but antimony is worse.

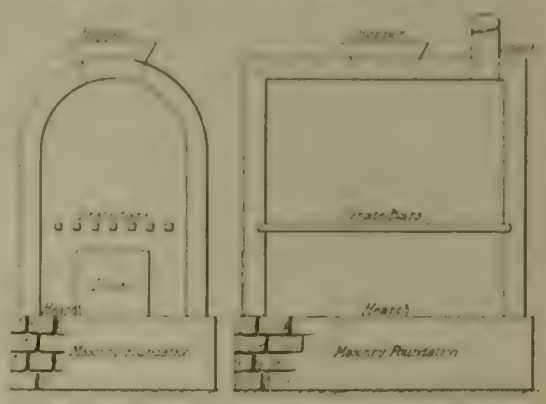
MINE OWNER.

Tucson, Arizona, August 5.

Furnace for Burning Mill Chips

The Editor:

Sir—Wedges from the boss-head, chips, and other small bits of wood from the mine are always finding their way into the mill mortar. Where amalgamation is practised inside the mortar, amalgam attaches to these bits of wood. These bits of wood should be saved and burned and the ashes worked in the clean-up barrel with quicksilver. A suitable furnace for this purpose may be built of brick after the design here illustrated. Convenient dimensions are: From hearth to top of the grate bars (made of pieces of old T rail), 15 in.; from top of bars to centre of arch, 48; inside length, 48; inside width, 30. The furnace should be built with an opening at the front extending from the hearth upward to a height of 10 in., and this opening should be provided with a door, for the purpose of regulating the draught. In the top of the arch should be left a hole, either square or round, in which it would be well to arrange a hopper for convenience in feeding the chips to the furnace. At the back end of the furnace, either in the end or the top, a hole must be left which should be fitted with a stack. The furnace may be constructed on a foundation of stone masonry, or may be built level with the ground as suits the fancy of the builder. If elevated somewhat, a receptacle may be placed below the door to receive the contents of the hearth when it is drawn out. The hopper can



be of sheet iron or steel, or may be omitted altogether, if desired, though it would be found very convenient. There is usually suitable material lying about the mine from which to make one at little cost. At the bottom of the hopper, which should set about the middle of the arch, should be arranged a cover of some sort; a heavy piece of steel plate, such as that from which skips are made will do. It should be provided with a ring, so it can be readily lifted when necessary. The smoke stack may be of ordinary stove pipe, as the heat will not be greater than that from a stove. Chips can be completely burned in such a furnace as is here described, and all the gold contained in them recovered at small expense.

MILLMAN.

Angels, California, August 3.

Are Engineers Honest?

The Editor:

Sir—I send you an abstract from a letter received not long since from a friend who clearly sets forth his ideas as to why so many business men look upon mining investment as unsafe.

"The false note of which you speak regarding the visit of a mining engineer to the Oriental mines was not written by me, but by Mr. H——; an old practical miner who has a distinct dislike for the average mining engineer; and I don't know that he is far from wrong, as I can say that personally I have found about one out of twenty that can be trusted when it came to the fine point of honesty. I have seen business men (manufacturers) pass upon a mine who had almost no knowledge of mining, but who with the help of a practical mining man were able to make about as fine a talk on a mining property as I have ever listened to. A mining engineer sent out by possible investors themselves is all right, but a mining engineer in a local community of mines al-

most invariably favors his locality, and you know yourself, as a mining man, that it is a mighty easy thing for such a man to keep his skirts clean while giving wrong advice; in fact, advice that he knows he is not warranted in giving. I have seen this done many times where a mining engineer recommended a property he knew did not stand one chance in a thousand of making good. Nearly every mining company that launches a new mine has one or more reports by mining engineers, and there is about one in fifty that is worth more than the paper it is written on; these reports are paid for by the mining companies, and the engineer examines just what they direct him to examine and nothing more, and makes his report accordingly. It is time that reputable mining engineers, for their own good, wake up to the fact that their profession is being abused; and they should band themselves into a society for clean methods and the elimination from their ranks of the dishonest undesirable element. Mr. H—— has seen a lot of 'hungry coyotes' in the garb of mining engineers who have robbed Easterners by false reports and done a vast amount of damage to legitimate mining by the recommendation of properties which had hardly a speculative chance of making good. He said in his letter, 'go yourself,' and my experience teaches me that he is pretty nearly right, because, if a common-sense business man will go to a mine and examine it in the same way that he would examine anything else he is buying stock in, he would seldom make a mistake. The great trouble with visitors to a mine is that they generally make it a junketing tour, hustle around with a beer or whisky bottle in their hands, are captivated with the thought that they are finally miners, and go away knowing as much about the property as when they came."

COMMON SENSE.

Denver, August 3.

[While we object to the sweeping condemnation of engineers, there is much good sense in the above. It calls to mind an examination made by an engineer not long ago of a group of mines in Mexico. The property was situated 60 miles from the nearest railroad and was in charge of a man who was a respected fellow townsman of the Americans who were furnishing money for operating the property. After spending many thousands of dollars in development it was considered good business to have an engineer's report, notwithstanding that the owners had in their possession three typewritten reports by as many engineers, and a printed prospectus containing statements abstracted from these reports and also evidently obtained from other sources. The directors of the company employed an engineer and directed him to make a careful examination and exhaustive report, and he accordingly went prepared to remain a month, or longer if necessary.

The mines were reached without any unusual difficulty, the description of the situation of the property in the reports, proving accurate. This, and some figures giving approximate elevations of points in the vicinity, were the only things that approached truth in the entire lot of reports. Several veins and their workings had been described at length. One was said to be 12 ft. wide, developed by two adits, about 100 ft. vertically apart. The ore sent to the home office showed 'free gold' in alluring quantity. Another vein was said to outcrop from the river up the side of a mountain to its summit, 800 ft., and to be valuable, although it had not been developed. A third could 'be traced' by its bold outcrop for several thousand feet through the property, and was opened by various shafts, adits, and open excavations. It was described as being 10 to 20 ft. wide, and 'beautiful ore.' Still another vein was so rich that the *gambucinos* had systematically robbed it at every opportunity.

After arrival at the company's camp it did not take the visiting engineer long to learn the true conditions. The first vein, '12 ft. wide,' had dwindled to a miserable little streak less than 2 ft. wide at its greatest breadth, averaging 8 inches in the two adits (which, strange to say, were actually found to have been driven). At one place, in one of these adits, the vein where 4 in. wide showed a little gold. This 'shoot' was less than 4 ft. long. The average value of ore from these workings was less than $2 per ton. An examination of the great vein 'running uninterruptedly for 800 ft. up the side of a mountain,' proved it to be a sheet of quartzite 40 ft. thick lying on top of the hill, and of a remnant of the same sheet capping another hill-top near-by. Worse than this, there was no gold in the rock. The other large vein of 'beautiful ore' did outcrop at intervals, and about 300 ft. of work had been done on it, but the rock was extremely hard and was low in grade to match its adamantine character, while the miserable *gambucinos* had extracted every pound of ore. Two days of climbing over the hills and three days sampling were all that were necessary to prove the absolute worthlessness of the entire property. But what of the manager? He lived, 'Mexican fashion,' in an abode house at the camp, kept a store, stocked at the company's expense, and in addition to his salary made considerable profit selling goods and provisions to the natives who lived for miles up and down the river. He seldom if ever went up on the hill, had an easy time, and was 'doing well,' but no longer thereafter than it required for the company to close the mine and order him home. He closed the mine, but did not go home.—EDITOR.]

The Shasta region in California, recently described by L. C. Graton of the U. S. Geological Survey, is the second largest copper region in the United States that can be considered a geologic unit. In shape it forms a curved belt 35 miles long, popularly known as the 'copper crescent.' Copper sulphides have been known to occur with the gold lodes of this region for many years, but were not handled until 1895, and since that year the region has produced 300,000,000 lb. of copper. In 1909 it produced 50,000,000 lb., which makes it rank as the sixth or seventh copper district in the United States. The ores are pyritic and are of medium richness, averaging 3 to 3½%. Some of them form the largest sulphide orebodies in the world, measuring 1200 by 300 by 300 ft. They represent, not the filling of cavities, but the replacement of the surrounding rock.

Concentrates

Most of these are in reply to questions to which by our readers are invited to ask questions and to information dealing with the practice of mining, milling and metallurgy.

A flow of 200 miner's inches of water under a head of 300 ft. will develop theoretically 135 and actually 122 horse-power.

A grade of 5 in. in 100 ft. is that commonly given tracks in mines where the cars contain 1800 lb. and tramming is done by men.

Oil has never been discovered in any well in the Mojave or Colorado deserts of California, although several have been bored.

In surveying vertical shafts it is advisable to use heavy plumb-bobs—up to 200 pounds in very deep shafts, as their use insures greater accuracy.

Gauge-cocks on steam-boilers should always be kept in good order, and should be tested frequently, as the water-glasses are known to be unreliable.

High voltage when distributed from a generating plant to consumers on three wires is not divided between these wires, but each carries the same voltage.

Tin occurs in a number of the States from the Atlantic to the Pacific, but contrary to popular belief the Government has never offered a reward for its discovery.

Measurements can be made in a rugged or brushy country by the careful use of a transit fitted with stadia wires with fully as much accuracy as with tape or chain.

To ascertain the force of a current of air in a mine, multiply the square of the velocity of the air in feet per second by 0.0023. The velocity of the air can be measured by an instrument called an anemometer.

Metal tamping bars are illegal in several of the Western mining States. The fact does not seem to deter careless miners from using an iron spoon, or other iron rod, if it chances to be handy. The practice is extremely dangerous and men are not infrequently injured in this manner.

Drift mines in California are extensive. The largest is the Hidden Treasure-Mountain Gate, at Sunny South, Placer county. The workings here extend more than five miles under cover, and the greater part of the channels are buried beneath 1200 ft. of volcanic débris.

In blasting, miners should remember that with high explosives, the stronger or sharper the initial shock given by the exploder the more complete is explosion of the charge of powder, and the less the quantity of gas formed. The low-grade caps (detonators) XXX often used, are considered less dangerous. This is true in so far as the quantity of mercurial fulminate (which is the exploding substance), is concerned, for its explosive force is in proportion to its volume, but a small quantity of fulminate is liable to lack sufficient force to explode the powder as quickly and completely as the higher grade caps, those containing a greater amount of fulminate, such as XXXXX, XXXXXX and what are known as No. 10 special caps. These, though a little more expensive than the detonators of lower grade, are far more economical.

The silver content of a solution of KCy may be determined by adding to a measured quantity of the solution to be tested a standardized sodium sulphide until a drop removed by a glass rod will give a brown color when added to a drop of alkaline lead tartrate solution. If sodium nitroprusside be added the color will be purple. Place the two drops side by side on a piece of white filter paper, and when the liquids unite the color will at once become apparent. The sodium sulphide solution can be standardized by adding in excess a solution of double cyanide of silver and potassium, filtering and titrating the liberated cyanide in the usual manner, after adding potassium iodide. The following equation represents the reaction:

$$1 \text{ gm. KCy} \begin{cases} = 0.3 \text{ gm. } Na_2S \\ = 0.8284 \text{ gm. Ag} \end{cases}$$

Vanadium ore is treated at Newmire, Colorado, and its reduction to a commercial product is accomplished in the following manner: The ore is crushed to 1-in. size in a breaker, then passes crushing rolls where it is ground to 20-mesh. It is then introduced into a reverberatory furnace with the addition of salt. It is rabbled and worked toward the discharge end of the furnace by hand and is drawn out on a cooling-floor. As a result of the roasting sodium vanadate is formed with the liberation of chlorine. The ore, when cool, is placed in a tank and water turned on, which dissolves the sodium vanadate, compressed air aiding in the process. The solution is drawn off and the vanadium precipitated as ferrovanadium by the addition of a solution of ferrous sulphate. In this form it is sold to the trade. The price is about $5 per pound for the metallic vanadium contained in it. There are several other processes for treating vanadium-bearing ores, but that above given is the simplest.

No legal responsibility attaches to the owner of a mine for the misrepresentations of promoters, to whom he has given an option to purchase the property, unless said owner is a party to such representations, and the agreement between owner and promoters states that the money to be paid for the property is to be raised wholly, or in part, by the sale of stock in a company organized for the purpose of raising money through the representations of the promoters. The owner is presumed to know nothing of such misrepresentations, and is therefore not in duty bound to make known to prospective purchasers of stock that they are being deceived by the statements made by promoters. The question has an ethical as well as a legal side, but even if the mine-owner has knowledge that misrepresentations are being made concerning the property, he is not legally compelled to make such knowledge public.

Special Correspondence

LONDON

Cornwall Mines. — Hingston & Clitters. — Wheal Kitty & Penhalls.—De Lamar Improves Mill.

The Hingston & Clitters Co., operating in East Cornwall, is again looking for capital. The present company was formed in 1908 as a reconstruction of Clitters United. The mines are old tin properties containing wolfram and arsenical and cupriferous pyrite, and they were reopened in 1900 by the Allen-Schiff group. A modern dressing plant, which has the distinction of having been the first to separate the tin and wolfram magnetically, was provided. The unfortunate part of the business was that the plant was erected at the Clitters instead of the Hingston mine, for the best ore is found at the latter, and it has to be transported more than a mile to the mill. Also the underground development was neglected and the mill erected before any reserve was proved. The old shafts which were crooked and in bad condition were used instead of a new one being sunk. Modern ideas were applied to the metallurgy and not to the mining. In the course of a few years the control passed to the Schiffs, Mr. Allen retiring. In 1908 the crisis came, for unearned dividends were paid, and the results of operations for 1907 ended in a serious loss. In addition the Hingston mine was flooded and there was no money available for additional pumps. The control then changed hands, and Mr. Allen once more came forward to provide funds on the reconstruction in 1908. Electric pumps were bought and the Hingston mine unwatered; the Clitters had never been worked below an adit. By the time the mine was put in order the funds were exhausted. R. T. Moore, of Glasgow, has examined the mine, and reports that about 15,000 tons of ore is in the mine; he recommends further developments at points specified at an expenditure of £10,000. If the results are satisfactory he advises the removal of the mill to Hingston at a cost of £5000 and the provision of a further £10,000 as working capital. He reports the plant to be in excellent condition; it consists of 25 California stamps of 1050 lb. each, 9 Buss tables, 10 Frue vanners, roaster, magnetic separator, and an Elmore vacuum plant for removing pyrite. At the present time it seems impossible to raise any more funds; one drawback is the existence of £18,800 of debentures the interest on which is accumulating dangerously. The company makes a small profit by treating tin-wolfram-pyrite concentrate bought in the market from all parts of the world, but as this class of business requires ready cash, the operations in this direction are naturally cramped. Wheal Kitty & Penhalls in the St. Agnes district of Cornwall is doing well and continues to make substantial profits. The report for the half-year, January to June, shows that the extraction per ton was less than during the previous four half-years, but as the stamps treated a greater quantity of ore and the price of tin was higher, the total receipts show an increase. The ore treated was 7191 tons, and the concentrate recovered 121 tons, being a yield of 37.7 lb. per ton. The average price received was £94 and the receipts £11,402. The new main shaft, Sara's, is now down 560 ft. and drifts are being cut east and west on a lode met at 540 ft. It is the intention to continue sinking another 300 ft. in order to reach the Kitty lode at depth, and in order to supply the necessary funds, 14,000 preference shares of 10s. each and bearing 10% dividend are being offered to shareholders and others. The money thus received (£7000) will also be sufficient to provide additional dressing and pumping plant. The shaft has four compartments and measures 15 by 7 ft. inside timbers; it is a good example of modern practice. The working cost during the half-year shows a decrease, and, considering the small scale, the number of different workings, and the large proportionate amount of development work, shows a careful attention to business. The total cost was 23s. 5d. per ton, of which 7s. 11d. was for mining, 4s. 10d. for development, 2s. 6d. for pumping, 5s. for dressing, and 3s. 1d. for repairs and administration. In addition royalties of 1s. 7d. brought the expenditure to 25s. per ton. During 1909 the corresponding figure was 25s. 6d., and during 1908, 26s. 11d. It must be remembered that old-fashioned Cornish stamps and dressing plant are still employed, as the company has never had any extensive supply of capital. In profit and loss for the half year the total receipts were £11,643, the costs £8984, leaving a balance of profit of £2659. From this, £609 has been allowed for depreciation of plant, etc., and £778 has been written off for the cost of Sara's shaft. The balance, with £1906 brought forward from 1909, gives a disposable balance of £3177. In order to provide funds for working capital a dividend of only 2½% for the six months is being paid, absorbing £664, so that £2513 is held in hand.

The De Lamar company, operating a gold and silver mine in Owyhee county, Idaho, was floated in London in 1891. For five years the profits were high, but on the exhaustion of the chief veins the dividends sank to next to nothing. Recognizing that the mine might still continue to be a producer on a smaller scale, the capital was reduced in 1901 from £400,000 to £80,000. During the nine years since, the total distribution has been 92% in the smaller capital. The mine continues to yield profitable ore which is obtained chiefly from old stope fillings and wells and by prospecting for stringers and bunches. In this way 44,961 dry tons of 2000 lb. was sent to the mill during the year ended March 31, estimated to contain $8.41 in gold and $3.23 in silver. The extraction was 17,121 oz. gold and 180,114 oz. silver, leaving 95c. gold and $1.51 silver in the tailing. The revenue was £91,604 from sale of bullion, and the costs at the mine and in London were £88,967. The company also received £398 from the sale of obsolete stores and £1172 from interest on loans. The available balance of profit was £4142 and £4000 has been distributed as dividend. The company has a reserve fund of £27,000 invested in loans at short call. The manager, Ernest V. Orford, reports that during the year £2000 has been spent on additional concentrating plant, consisting of eight Deister slime tables and two Wilfleys, the object being to make a better separation of the refractory constituents of the ore found below the eighth level. By means of this plant the extraction of the silver will be greatly improved.

FAIRBANKS, ALASKA

Iditarod. — Quartz Mining near Fairbanks. — Milling.—Placers.

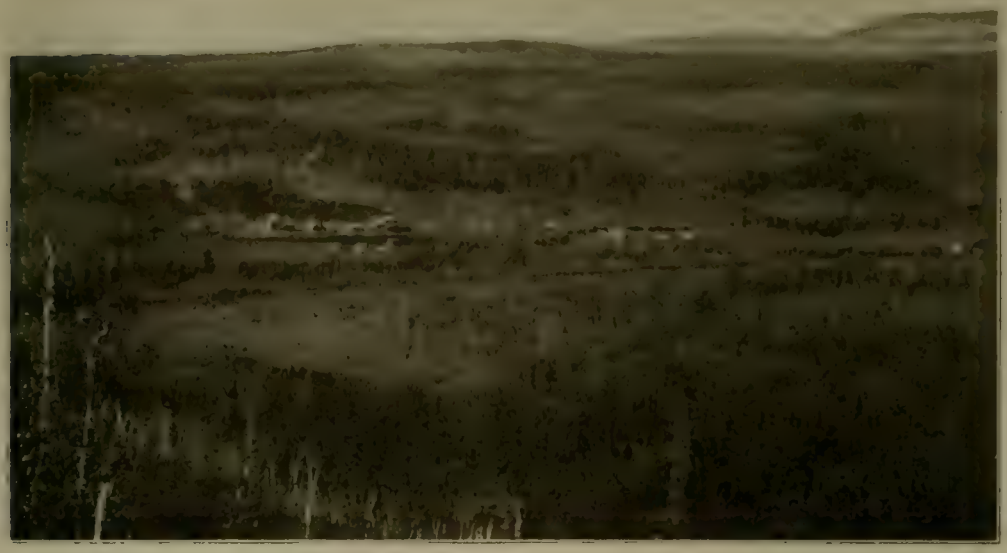
Although for several weeks after the stampede to the Iditarod, Fairbanks was a lonesome town and all operators were short of men, the first two boats from the outside brought limit loads of passengers and the mines are now full-handed. If the report is true that there are still 1500 men headed for Fairbanks to work in the mines, much suffering will result later. The opportunities are many for the prospector, both for quartz and placer, but after a certain limit, there are no openings for laborers. Reports from the Iditarod average about the same in that the class of people there who live off the population think the camp is good while those trying to work ground assert the camp is much overpopulated. Several clean-ups have been made, some exceeding expectations and others falling far below. The *White Seal* brought several thousand dollars in dust to Fairbanks on the last trip, mostly in small lots. A characteristic of the dust is the prevalence of cinnabar, especially noticeable in Otter Creek dust. This is hard to clean from the gold before melting and some melts have lost as high as 6 per cent.

Many of the 'cheechacoes' have started prospecting for quartz and in one case have met with gratifying results. Four partners have opened a 16-ft. vein on Vault creek that promises exceedingly well. Between the well-defined walls are 16 ft. of vein matter consisting of graphitic schist and quartz in which free gold can be readily seen. Three claims east of this find, Louis Fredericks, an old-timer, has found a 4-ft. vein which is the typical gold-bearing quartz of the district. A vein of antimony lies on one wall. Assays made recently show from $40 to $133 per ton. Below the adit at the head of Moose creek, E. W. Herschberger has picked up a small vein of rich quartz. It is a foot wide with high-grade filling. It should be borne in mind that

this district is several miles from the Cleary district where so much good quartz has already been found. This explodes the oft-repeated knock that all the Tanana quartz consists of a few stringers in the Cleary hill. Several miles down Fairbanks creek the Cook brothers while following a trace of gold uncovered a 7-ft. vein that averages well the full width. On one wall is almost a foot of oxidized galena assaying 220 oz. of silver per ton. It is thought that sinking will develop a good orebody. Effort is being made to interest capital in the development.

The citizens' mill at Fairbanks has been enlarged to stamps of 500 lb., and a concentrator of the Frue vanner type has been ordered by telegraph. As the 10-stamp mill at Chena will not be ready to operate earlier than September 1, the Fairbanks mill will be running constantly up to Carty's adit on Fairbanks creek. Croppings supposed to belong to the same vein can be traced for miles. It is understood that this vein is of sufficient value to warrant development. Mr. Buell of Herschberger & Buell brought in an average sample of their vein on Willow creek this week that assayed $100 per ton.

The output from placers in this district continues steadily. Four and five below Cleary are still in the old original Cleary pay and the weekly clean-ups average well into five figures. In the Hot Spring district Alexander, Morrison & Johnson who acquired the Chute-Stier option have had several satisfactory clean-ups. This is open-cut ground and will show even better as soon as the scraper is installed. Many of the open cuts on Pedro creek in this district were filled by sand by the big rain and flood that again took



Hot Springs District, in the Heart of Alaska. Glen Creek to Pioneer Creek.

that time. Lucien Rhodes will ship every other day from his Bedrock creek property till the big dump extracted this winter is all crushed. The Crawford lease on the same property will also ship as soon as the mill is idle. Awaiting treatment at the Fairbanks mill is about a ton and a half of high-grade ore from the Sommersett & McCarty vein at the head of Fairbanks creek. As this is mostly 'picture rock', it is expected to break the present high record for Tanana quartz.

Work is still being actively pushed on the Redwing lease of the Jupiter Mars. The vein has been struck at a depth of 60 ft. and a hoist is to be installed shortly. Mr. Furstenau has ordered a thousand sacks for shipping to the Chena mill this summer. Spaulding & Clough are still running their adit to tap the shaft at some depth. The vein continues strong with no diminution in value. Although some surface prospecting has hindered work during the month, the adit is in 60 ft. At the head of Skoogy gulch, S. Scafford and Charles Thompson have built a water-power arrastre with which they reduce about two tons of rock per day. Although no clean-ups have been reported, nobody is worrying as to results. Near this property, Faulkner & Bradley are driving an adit to tap a shoot of ore they know to exist from their previous operations. Their former adit was destroyed by a slide. Hess & Burnett have located a 2-ft. vein on the Cleary side of the summit that averages close to $50 per ton. Part of the rock is high grade and the owners expect to ship ore this season. What is supposed to be the mother-lode vein of the Fairbanks mineral belt is the 14-ft. vein of solid quartz opened in Dan McCarty's adit on Fairbanks creek. Croppings supposed to belong to the same vein can be traced for miles. It is understood that this vein is of sufficient value to warrant development. Mr. Buell of Herschberger & Buell brought in an average sample of their vein on Willow creek this week that assayed $100 per ton.

The output from placers in this district continues steadily. Four and five below Cleary are still in the old original Cleary pay and the weekly clean-ups average well into five figures. In the Hot Spring district Alexander, Morrison & Johnson who acquired the Chute-Stier option have had several satisfactory clean-ups. This is open-cut ground and will show even better as soon as the scraper is installed. Many of the open cuts on Pedro creek in this district were filled by sand by the big rain and flood that again took out the Fairbanks bridge. Much delay and damage was caused.

TORONTO, CANADA

American Peat Society Convention. — New Districts.—Cobalt.— Other Camps.

The annual convention of the American Peat Society was held at Ottawa, on July 25 and 26, and was attended by 50 delegates, including several from Europe and Brazil. Eugene Haanel, Canadian Director of Mines, and president of the Society, occupied the chair. The importance of the development of the Canadian peat industry was dwelt upon, both by the president and Clifford Sifton, chairman of the Conservation Commission, special reference being made to the Canadian fuel situation. The coal deposits are for the most part in the extreme east and west of Canada, leaving the central portion dependent upon the United States for its coal supply. The forests, as a source of wood fuel, are being rapidly exhausted, while immense peat resources are undeveloped. Mr. Haanel pointed out that at present no estimate could be found of the enormous extent of the Canadian peat bogs. An area of 37,000 square miles was known to exist, but this was probably a mere fraction of their actual extent. In addition to the reading of a number of technical papers, the delegates visited the government peat plant at Alfred, witnessing the system in operation, full explanations of its working being given by A. Anrep, Jr., of the Canadian Department of Mines, a son of the inventor of the Anrep peat manufacturing machine.

The cost of producing a ton delivered on board the cars was given as $1.60. The methods employed were criticized as uneconomic by L. B. Lincoln, of the Peat Engineering Co., who claimed that by the substitution of machinery for hand labor better results could be obtained. The Fuel Testing plant of the Government, at Ottawa, was also inspected. A Canadian Peat Society was organized in affiliation to operate on the same lines, and a vigorous campaign will be undertaken to interest the public in the industry. Mr. Haanel was re-elected president. Among those in attendance were J. A. Gray, C. A. Meissner, and W. A. Forbes of New York, who were present in the interest of the United States Steel Corporation, which is keeping close watch on the development of the industry.

The Porcupine gold area is continually widening as new discoveries are made. Some important finds are reported from the new township of Deloro, south of Tisdale, one locality where several of the discoveries are situated being Gold Lake, some three miles south of Tisdala. The latest excitement among prospectors is over what is known as the Cripple Creek district, lying west of the Metagami and Lost rivers, and extending in a westerly direction as far as a chain of lakes in Denton township, all in unsurveyed territory. Such discoveries were made as early as May, but recent finds of a much richer character have induced something of a rush and much staking has been done during the last few weeks. The formation is similar to Porcupine, schist, porphyry, and quartz running into granite formation on contact. Most of the richer assays are from contact veins.

The small mill just built on the Timmins property was started for the first time on July 20, with highly satisfactory results, the ore treated running over $300 per ton. A new 30-stamp mill has been ordered by the syndicate. The shaft is 100 ft. down, at which depth the vein has a width of 10 ft. A company may shortly be floated. The question of power for the camp is engrossing much attention, as with the disappearance of the wood supply, it will be both difficult and costly to obtain fuel for the present and projected plants. As a means of supplying power a Montreal syndicate has acquired water-power rights at a point about forty miles from the centre of the district, and engineers are now making surveys and estimates of the cost of an electric plant.

At Cobalt the Nipissing, on July 18, cut a rich 8-in. vein at 275-ft. depth in shaft No. 64. It has since widened with driving and yields 1800 oz. per ton. The Buffalo is working on the 300-ft. level, which is the deepest mining in conglomerate formation in the camp. Vein No. 10, which was picked up at that depth, shows 4 in. of high grade yielding over 2500 oz. silver per ton. The Dominion Reduction Co. will erect a 100-ton custom concentrator at the Crown Reserve property on Kerr Lake. The shaft on the Union Pacific lease on Peterson lake is down 180 ft. It will be sunk to 200 ft. to allow of underground work below the lake. The Crown Reserve made an important discovery on July 21, being a 6-in. vein, assaying 3000 oz. silver per ton, 900 ft. distant from the nearest point at which pay-ore has so far been worked. The Cobalt townsite has reappeared in the list of shipping mines, sending away 24 tons of high grade. They have for some time been taking good ore out of the extension of some of the Right of Way veins. Charles Watson has been placed in charge.

A good surface discovery has been made on the Marathon property, South Lorrain, situated about a mile and a quarter north of the main mining area of the camp. The vein is of smaltite and niccolite, from 4 to 8 in. wide, and has been stripped for 100 ft. Silvers, Ltd., an unlucky Gowganda proposition, has been closed, a meeting of shareholders having decided that there was no prospect of its ever paying. The Dr. Redding Co., of Larder Lake, has gone into liquidation.

The charge of high-grading on a large scale that was preferred against George E. G. Rogers, captain of the Lucky Godfrey, at Elk Lake, and William Acker, employed as ore-sorter, came to nothing, the accused being discharged for want of evidence.

SALT LAKE, UTAH

Utah Copper Report.—Garfield Smelter Improvements.— Yampa Ships to Garfield. — Park City Changes. — Tintic News. — Wasatch Utah Mill.

The report of Utah Copper for the second quarter of the year shows a total production of 25,124,052 lb., an average of 8,374,684 per month. The net profits from mining and milling operations were $1,184,199. To this is added $356,428 Nevada Con. dividends and $8352 from miscellaneous sources, making the total income for the quarter $1,548,979. The average cost of production for the quarter was 7.53c. per pound, and for the month of May, when the ore averaged 1.2 lb. better per ton than in the other months, the cost was 7.17c. Mr. Jackling, Utah Copper's manager, denies emphatically that the Amalgamated had bought control of Utah, as recently reported from New York, and states further that he does not know of any attempt on the part of that company to do so. This being the case, some of the recent rumors of a great copper merger receive a setback. The steam-shovel operations of the Utah company have extended well into the town of Upper Bingham, so that the company has been obliged to purchase the ground. Most of the houses have been torn down, and one of the most thickly populated portions has been turned into a waste dump. An eighty-room three-story boarding house is being erected. Seventeen steam-shovels are now at work. Nearly 1000 men are at work on the Bingham & Garfield railroad, and it is expected that all grading and tunnel work will be finished by next spring, so that a year hence the company will be hauling its own ore. The road, which will be laid with 90-lb. steel, has a down grade all the way to the mills, with a maximum of 2.5%. The Copperton plant has been closed, ostensibly to curtail production during the dull period. Production at this plant has always been accomplished at a figure considerably in excess of that at the larger mill, and it is doubtful if operations here will be resumed.

At the Garfield smelter additional reverberatory furnaces and a brick stack that will be 350 ft. high are being erected. The plant now has 3500 tons capacity per day. With the new equipment it will become one of the largest copper smelters in the world. Within a year's time the plant will be outputting at the rate of 16,000,000 lb. of blister copper per month. Meantime at the Tooele smelter of the I. S. & R. another reverberatory has been finished and is ready for warming up. The Utah Consolidated has finished its contract with the Garfield smelter and is delivering to the Tooele plant. It is expected that the Giroux will commence shipping its high-grade ores within about three months' time, and an unconfirmed report from the East is to the effect that the South Utah will also ship to Tooele. This high-grade ore and concentrate will be most acceptable, as, while the Utah Con. ore is a good smelting mixture, the copper content is low. Surprise was caused by the announcement that the Yampa smelter was to close down, and at this writing the last furnace has been blown out. The plant has been a success metallurgically, but the Yampa ore is of low grade, and in order to keep the smelter supplied it was necessary to work the mine to full capacity, which did not permit of selecting the ore. The smelter has been treating about 700 tons per day, but will now ship about 250 tons to the Garfield plant. This smaller tonnage will permit of selecting the ore so that only the better grade need be shipped and the general average kept higher than it has been. Probably a favorable smelting rate was made, as the Yampa ore makes an excellent smelting mixture, being like the Utah Con., which the Garfield plant has just lost. With an improvement in copper prices it is not unreasonable to look for a resumption of operations at the smelter.

One of the most important deals in the history of Park City was put through a few days ago when the Daly-Judge closed a contract by which the Ontario drain tunnel will be extended from its present terminus in Daly West ground to the Anchor shaft of the Daly-Judge. The Daly-Judge has been submerged below the 1600-ft. level for some years, and this will afford relief. The tunnel taps the Daly West at

[illegible] will reach the Arctic shaft at [illegible] This will allow working on an extension of the ore shoot which is known to be rich, on which have heretofore been impassible. Work of extending the tunnel was commenced the day after the contract was signed. It will in no way interfere with the diversion of the Snake Creek current to the Daly bodies as this will be done and developed a different level. Completion of the contract has revived rumors of a great consolidation of Park City properties and S. M. Rambergen of the Daly West and Ontario has admitted that consolidation of the Daly West and Ontario is being discussed. Several properties in this district have interests in common and could be operated to advantage under one management and consolidation is inevitable. The new extension of the tunnel will develop about 700 ft. of virgin ground in the Daly West. This company is considering the building of a new concentrating mill at the mouth of the Ontario tunnel. The matter is being investigated by engineers and will be put up to the directors as soon as their report is ready. The Daly West declared its usual quarterly dividend, but did not include the customary report, as certain returns had not been received. The mine has developed a large tonnage on the 1700 and 1800 ft. levels, but reports are that the assays from these points have been disappointing.

The new pumping plant of the Centennial Eureka should be in operation by the middle of the month or soon after. The plant will be in two units, each with a capacity of 500 gallons per minute, and should be able to handle all of the water for some years to come. The water will be discharged through the Holden tunnel, which taps the shaft at the 550-ft. level. Power for operating the pumps will be generated at a steam-electric plant at the mouth of the tunnel. The Opex is closed for repairs to the hoisting equipment, which should be completed in a week's time. Much indignation has been felt by the public and stockholders at the attitude the management has taken lately in refusing to give out any statement as to conditions in the mine. The recent report of a discovery has been traced to one of the under officials of the company, and it has been assumed that those high up connived at the announcement. The directors held a meeting recently and levied an assessment of three cents per share, but refused to give out any information, even to stockholders. The general impression is that the find was made, but was in Centennial Eureka ground. The stockholders are hoping that a little more prospecting will show that the vein is in the Opex. The Victoria has voted to increase its capital stock from 250,000 to 700,000 shares, the par to remain the same. Stockholders will send in their old stock and receive two shares of the new for one of the old. Of the stock 100,000 shares will be set aside to acquire the Snowflake Mining Co., and 100,000 will remain in the treasury. The Victoria is sinking its shaft to get to the deep orebodies which have been worked through the Grand Central. This necessitates a haul of several thousand feet. The new Hendrie & Bolthoff double-drum hoist ordered for the Eagle & Blue Bell has been delivered and will be ready in two weeks. The new equipment is good for 2000 ft. The shaft has been sunk to the 400-ft. level, while the raise that has been driven from the 1000-ft. to meet it has advanced 100 ft. The Lower Mammoth is centering operations on the 1800-ft. level. Developments on the 2000-ft. level have not been up to expectations. An assessment has been levied to take care of an overdraft at the bank and the stockholders will doubtless be called upon before long to decide as to the future of the mine. The Dragon has commenced sinking its shaft from the 600-ft. level and will continue the work until the 1000 is reached. Experience in the other Tintic mines has proved that good ore is usually found under such iron as the Dragon has on the upper levels, and the company is going deeper in the expectation of encountering it.

The Bullion Coalition at Stockton is extending the old Honerine tunnel, already 12,000 ft. in length. The incline from the 600-ft. level to the surface is also being put in shape. The producer gas-electric plant of the Gold Springs Mining & Power Co. at Modena has been started and is operating successfully. The Jennie mine, which is owned by the same company, is shipping [illegible] daily at mine and mill. The plant uses coal. The Secret of the Utah Mines Consolidated has tapped the old Beaver Pass vein at a depth of 900 ft. and is drifting. The Beaver Pass was a good producer in its early days but was shut down because of the heavy flow of water. The new tunnel will drain the mine at depth, relieving this difficulty. The Wasatch Utah has installed a two-stamp concentrator, and is mining and concentrating ten tons of ore per day. The ore runs $16 to $20 in gold and makes a concentrate averaging close to $100 in gold, with copper and silver in addition.

WASHINGTON

Fire and the Geological Survey – Alaska Land Claims. – Bureau of Mines

For the fifth time in the last seven years the Washington fire department has rescued the priceless records of the Geological Survey from devouring flames. On Sunday afternoon July 31, they made their latest successful attempt. That is the last unless another fire breaks out before this reaches the reader. A shoe store, with $20,000 worth of goods situated on the first floor, lost everything and $1000 damage was done to the Survey library. The story is not true that one of the young women employed at the Survey objected to a fireman coming in with heavy dirty boots. Firemen are always welcome at the home of the Geological Survey and are greeted cordially. In fact, they have attended so many warm functions in the Survey building they know every nook and cranny. This intimate knowledge of the hospitable walls of the building is responsible for the slight loss to the Government. The firemen did not flounder through the dark halls and fall over large jars that are placed at the doors of many rooms. When the chief on the sidewalk shouted, "Jimmie, turn the hose on in the Director's room," Jimmie knew just what was meant. It is feared in some quarters that this latest fire may have a bad effect on Congress this fall. After every fire some eloquent member has discoursed for an hour or more on the danger of a conflagration wiping out the millions of dollars worth of records. This was generally followed by a bill for a new building. Then some other member, who had not thought of the danger in time to make a speech, promptly killed the bill. Last year the Survey building escaped a fire and Congress actually authorized a new building for the Survey, the Bureau of Mines, Reclamation Service, Land Office, and Indian Office, to cost $2,500,000. Enough money was appropriated for drawing plans and it was expected that an appropriation for a real fireproof structure would be forthcoming at the next session. If Congress follows out its usual line of reasoning on this proposition, there will be no money for a new structure. The argument will be that the present building cannot burn. Hasn't it been on fire five times and isn't the building still there? "Let us have a care for the peepul's money in these days of billion-dollar congresses." And so the Survey people may be doomed to remain in the present building for years, with frequent, unexpected little parties attended by the helmeted firemen. George Otis Smith, Director of the Survey, takes another view of the case. He says: "The fire gives emphasis to the wisdom of Congress in authorizing at its last session for the preparation of plans for a government building that will not only be better adapted to the peculiar needs of this scientific and map-making bureau, but will insure the safety of the public records that have been five times endangered by fire destruction since 1903. The loss of government property is thought to be less than $1000, but an incalculable loss might easily have been incurred in the library, which is unique in its collection of geologic literature, containing, as it does, more than 65,000 volumes as well as 85,000 pamphlets and 35,000 maps, and constituting the most complete collection of geological works and maps in this country if not in the world. The destruction of these by fire would have deprived not only the geologists of the Survey, but the scientists of America of a reference collection that could not be duplicated."

An investigation has been ordered to determine the validity of titles of all coal lands in Alaska outside of the Cun-

ningham claims. The latter claims have been subjected to a special investigation and are now awaiting action by the Commissioner of the General Land Office. Andrew Christensen, chief of the field division of the Land Office, will have charge of the investigation. He will endeavor to learn whether the claimants of the coal lands are maintaining good faith and will attempt to cover all the technicalities involved in the titles to the Alaskan coalfields. Among the principal claims which will come under this investigation is the Greene group, comprising 90 entries, and the Harriman group. Mr. Christensen expects to leave for Seattle within a week to establish headquarters. Experts are now in Alaska looking after many details of the investigation. Thousands of acres of unappropriated lands which were eliminated from the national forests and restored to the public domain by recent proclamation of the President, will be thrown open to homestead settlement and entry this fall, according to orders of the Interior Department. The lands are in Colorado, New Mexico, Washington, Oregon, Utah, Idaho, and Wyoming. Appointment of a permanent Director of the Bureau of Mines is still to be made. Mr. Smith has gone to Europe and Mr. Holmes is in the West arranging for the new mine-rescue stations. J. K. Jones, president of the Pittsburg-Buffalo Coal Co., has come out in a strong interview insisting that Mr. Holmes should be appointed, but it is not probable that any change will be made immediately.

NEW YORK

Plight of the Shearers.—Rumors of the Copper Merger or Agreement.—Some Western Coppers.—Price of Copper and Silver.

The low tide of the vacation season has grounded an immense number of the smaller financial craft high up on the mud. The ubiquitous, and always mentioned, oldest inhabitant is insistent in his expression that the present ebb of the financial waters is the lowest within the memory of man. Wall Street is confronted with the one thing it cannot overcome. The big public has its head turned in the other direction, and refuses to look around. One particularly amusing feature of the situation is the cry of the Eastern financial leaders that all the balance of the country has become ruinously extravagant, has taken to automobiles and pianolas to the great detriment of the market. The farmer, never so well to do as just now, has evidently made up his mind that, if any one rides in an automobile purchased with his money, it should be himself—an exhibition of good judgment, that will cause a scarcity of lambs and a light clip in Wall Street and possibly may result in some of the shearing gang having to go to work. With the good roads' movement growing and the exaggerated crop scares out of the way, the farmer, the country banker, and the country merchant, can continue to give their support to the automobile industry directly rather than by way of the stock market. The problem is a serious one for Wall Street, the political situation and the attitude of the public are interwoven. To disarm the prevailing prejudice and at the same time to make a fight politically in behalf of the corporations requires more dexterity than appears available. The bumptious 'show-me' attitude of the West is greatly deplored and just at this time is both annoying and disconcerting. The awakening of the West to its independence is joyful, the later realizations of the East are painful. In mining circles the problem of copper curtailment is foremost, the chief question being the ultimate result of the attempt to cut down production. If copper producers can be aided by a little increased activity among consumers, they may succeed in getting the copper surplus out of the way before the prospect of higher prices brings more production into the market. While none admit any agreement, announcements are made as to the percentage of curtailment, and record-breaking is at an end for a time. Whatever terms may have been agreed upon in the division of the smelting industry and the selling-end of the metal market, the public is evidently not to be taken into confidence, nor is any agreement in restraint of trade to be revealed to the Federal authorities. Since copper mining is to slow down, the first effect of the move will be a turn to the precious metals. Nevada Consolidated, making the cheapest copper in the country—according to statement, 6.34c per lb. for the quarter ended June 30, and Utah Copper holding a place as the largest single producer, give the A. S. & R. Co. a commanding position. Curtailment at Butte by the Anaconda in June was offset by the activities of some of the newer companies. As a result Butte produced 4,000,000 lb. more copper in July than in June. While there is no talk of copper merger, there are consolidations under way that mean further concentration of management in each instance. The absorption of Gila by the Ray Con. has been almost unnoticed. Now, the consolidation of Calumet & Arizona with the Superior & Pittsburgh, is to give the latter an up-to-date plant and the former an opportunity to use its $3,000,000 surplus in the acquirement and development of the latter's ore reserves. It is probable that the Chemung Copper will be taken into this merger. This property consists of 240 acres in the Burro Mountain district of New Mexico.

The Development Company of America which has been a factor in the exploitation of enterprises in the Southwest, has found it necessary to call upon shareholders to deposit 51% of their holdings with the company, to be used as collateral for a loan with which to aid the subsidiary companies to a paying basis. Among the propositions put out by this company are the Tombstone Con., the Imperial Copper Co., at Silverbell, Arizona, equipped with a smelter and which recently absorbed the El Tiro; the Poland Mining Co. and a new railroad which is to connect the Imperial Copper with tidewater on the Gulf of California. The Imperial Copper Co. has been producing 800,000 lb. of copper monthly, but closed down on account of the low price for copper. The newly acquired territory of the El Tiro has developed 8,000,000 tons of ore, said to run from 2 to 3½% copper.

Thomas L. Livermore, vice-president of the Calumet & Hecla for 21 years, is to retire at the annual meeting, August 17. He presided at the meeting of the Copper Producers' Association for the last time on August 7. His successor has not been chosen. Miami Copper is expected to be producing by January 1. It is said there is a possibility of a small additional stock issue being offered to present holders, which is likely as the plant cost $500,000 more than was anticipated. The copper metal market has responded somewhat to the prospect of a dwindling surplus. Lake Copper is held by the Calumet & Hecla at 13c., while the United Metals Selling Agency reports sales of 100,000,000 lb. at 12½ and 12⅝c. in the last two weeks. This agency has been supporting the metal market and was supposed to have accumulated a heavy load of metal. These sales preclude the possibility of a large surplus in their hands. Of the amount mentioned nearly all went into the stocks of domestic consumers. A recent cave-in at the Granby displaced 100,000 tons of ore. However, the ore can all be mined. Diamond-drill work is being pushed on the Granby; on the 400-ft. level. Granby is claimed to be making money even with its present increased costs, though the management maintains an attitude of silence and shareholders are left to form their own estimates. A. E. Stillwell, one of the prominent figures in the present development of Mexico, has returned to New York, after a four months campaign abroad placing the securities of the Kansas City, Mexico & Orient railway, which is to extend from Kansas City to Topolobampo, Mexico, 1659 miles, of which 878 miles have been completed. Mr. Stillwell has organized subsidiary companies to give attention to the development of the mineral resources along the line.

The silver market during the month showed the highest average price for any month of the year so far—54¼c. Cobalt operators figure this to mean an additional $1,040,000 in dividends for Cobalt, estimating the output of the camp for 1910 at 26,000,000 oz. The shareholders of the Tonopah Belmont have been disappointed at the failure of the directors to announce a definite dividend policy. It is said that the board foresees the necessity of doubling the present capacity of the Belmont mill and for the time it will be necessary to utilize the earnings for that purpose. The 60-stamp mill can handle 200 tons daily.

General Mining News

ALASKA

(Special Correspondence.) Seattle men are exploring the Red Wing mine in Ketchikan district and if conditions are favorable will continue the mining and development there. Several new orebodies of good grade have been struck recently at the Jumbo. Another shipment is being made from this [redacted]. The steamer *Northland* is taking on another [redacted] from the Ic mine. All the drifts are in good ore. A diamond drill has been installed at this property.—J. J. Martin, representing the Chicago Exploration Co., is examining the Unuk placers of 6000 acres, with Empire drills. The ground is reported to carry gold from 25c to 50c per cu yd. J. W. Daily has men repairing the wagon road up the Unuk river for the purpose of transporting machinery and supplies to the mines. A small test shipment is being made from Seal Bay by P. Heaney. The tunnel is in 1600 ft. and nine well defined veins have been cut, some of them carrying good ore.

Ketchikan, August 1.

ARIZONA

The report of the territorial auditor for the year 1909, shows the total value of all mineral products to have been $42,946,745. Under the mine taxation law, taxes are paid on 25% of the output which would be 10,736,686.29.

The following table shows the tonnage of the various metals produced in the territory last year:

Pounds of copper	297,703,301
Ounces of gold	132,278
Ounces of silver	2,352,356
Pounds of lead	2,153,102
Pounds of zinc	6,053,145
Pounds of iron	3,325,347
Pounds of sulphur	553,090
Tons of lime	23,331
Tons of silica	22,589

This was the first year in which the tonnage of lime manufactured was reported.

GILA COUNTY

In the Globe district, the Phelps-Dodge interests employ 500 men above ground and 500 in the mines. Four furnaces are being operated and are making full runs.

MOHAVE COUNTY

The Tom Reed Mining Co., near Goldroad, has recently installed a 16-ton electric motor to drive tube mills and other machinery.——William Ochs, of Salt Lake City, has closed a deal for the Gold Trail property of A. L. McKesson, near Goldroad.——It is reported that the Tyro mine, in the Union Pass region, will soon be operated by Eastern men represented by W. Harvey Weed, who recently made an examination of the property.——A few days ago the Keystone mine, at Mineral Park, made its first car shipment of ore to the smelter. The ore came from the new workings, and is said to be rich in gold and silver. By the time the shaft reaches a new level the stopes will have been opened in the levels above and the property become a regular shipper. At present all the ore that goes into the shipments is taken from the drifts, the dump ores being shipped by themselves on account of the freight rate.——William and Frank O'Dea have been working on the Pilgrim mines, west of Chloride, and report a body of rich gold ore at the 200-ft. level. The shaft was sunk on ore following the hanging wall and no attention paid to the vein lying below the fault. The owners have run a cross-cut into the foot and found the best body of ore ever seen in the property. Specimens show free gold.

YAVAPAI COUNTY

At the White Cloud mine, near Wickenburg, Edward Casper was killed and Joseph Peruna seriously injured a few days since by the falling of a cross-head a distance of 300 ft. as they were descending the shaft. The cross-head became jammed near the 100-ft. level, and the bucket continued to descend. It finally became loosened when the [redacted] and was within a few feet of the bottom, the [redacted] and [redacted] were killed [redacted]. Machinery and timbers are [redacted] at the Verde & Arizona Copper Co.'s [redacted] in the Jerome district.——At the Hull [redacted] is [redacted] to be [redacted] a few feet of the [redacted] by the [redacted] shaft.——At the Jerome Verde mine the sinking of the main shaft is to be resumed as soon as the water is out.

CALIFORNIA

AMADOR COUNTY

(Special Correspondence.)—The Climax mine, near Pine Grove, has been sold to the Gold King Mining & Milling Co. Fredrick A. Stokes, of New York, is heavily interested. The Climax has been developed to a limited extent but has been idle since 1906. The new owners will promptly com-

Forty-Stamp Mill, Argonaut Mining Co., Jackson, California.

mence operations.——The Bunker Hill Co. paid its 49th dividend, amounting to 5c per share, on July 15, making $80,000 disbursed in profits during the past six months. Most of the ore is coming from the 1750-ft. level where the ore showing is large. It is expected to commence production from the 1950-ft. level within a few months.——The Argonaut directors have decided to temporarily suspend dividends, chiefly owing to the costs attending the

Surface Works, Kennedy Extension Mining Co., Jackson, California.

litigation with the Kennedy Extension Co.—The strike recently made in the Central Eureka continues to stimulate interest. Latest advices are to the effect that the ore is showing good value as development progresses.——The Kennedy is pushing development vigorously on the 3300-ft. level, where 12 ft. of ore is being mined.

Jackson, August 5.

MADERA COUNTY

It is currently reported that Charles M. Schwab is interested in the development of the great iron deposits in the Minaret district, and that the Guggenheims are also spending money on development of iron at the summit of the Sierra Nevada. The Federal Development Co. has spent more than $20,000 in the district in the exploration of iron deposits. The Noble Electric Steel Co. is laying in a large stock of supplies with the evident intention of working throughout the winter of 1910-11. This company is said to be active in securing power sites in that region, and it is said the Guggenheims are looking into the transportation problem.

MODOC COUNTY

(Special Correspondence).—A discovery is reported from the mine of the Fort Bidwell Con. Co., near Fort Bidwell, where a 9-in. streak averages $170 gold. The discovery

was made under the direction of Algernon Del Mar, the new manager. Some of the ore is extremely rich. The property is equipped with mill and cyanide plant.

Fort Bidwell, August 5.

NEVADA COUNTY

A large barn owned by the Tarr Mining Co., and a dwelling owned by Mrs. James Kelly, of San Francisco, in the Smartsville district, were destroyed by fire last week. This is the second fire that the Tarr Mining Co. has had within the last year. It was supposed to be of incendiary origin. ——Rich ore has been found by C. L. Wilson, who is developing the Black Bear, Metropolitan, and other claims below Moores Flat. Mr. Wilson says that the bonanza ore was taken out of the Black Bear, which is reached through the adit on the Metropolitan. It is the intention to run another adit further down the hill. It is planned to erect a 20-stamp mill on the group, as there is plenty of ore to keep the stamps busy. The district is on the Nevada county side of the Alleghany mineral zone.

PLUMAS COUNTY

The property of Joseph Peppin, consisting of five locations, and the Caldwell group of six, belonging to J. A. Hall, adjoining the Frazier group, have been bonded to the Consolidated M. & M. Co., of Alameda. In the past, both of the properties have been dividend-payers. On the claims owned by Mr. Peppin there is a 10-stamp mill which will be used to sample the ore taken from the two claims. The main adit on the Frazier group, in several hundred feet, will be extended.

TRINITY COUNTY

(Special Correspondence).—It is reported that the Bonanza-King hydro-electric power plant, near Carrville, is to be rebuilt.——The Headlight company will build a bridge across Trinity river at Buckskin Point, south of Carrville, to facilitate the bringing in of supplies during the high-water periods. It will be a 125-ft. single span steel structure, with concrete piers, costing $4000.——Flume construction will begin shortly. Ground has been broken for the power plant and the right-of-way for power-line is being cleared.

Carrville, August 7.

TUOLUMNE COUNTY

(Special Correspondence).—A find was made last week in the Intervenor mine, in the southern part of the county, and being operated by W. H. Remington, and associates. The discovery was made in a drift, where high-grade ore, 4 ft. wide, was opened. t is said a larger force will be employed, and the road to the property repaired, preparatory to hauling in machinery and lumber for buildings.——The company interested in the Fleming mine, at Campo Seco, two miles south of Jamestown, contemplates putting men at work on development. It is reported the management will install machinery.——A lot of machinery has arrived at the Moffit Bridge gravel mine, on the Tuolumne river, including an engine and pumps. Excavating a ditch to divert the river, and other preparatory work was commenced months ago.——Work is in progress at the Jumper mine, near Stent, preparatory to renewing operations on a large scale. The surface improvements contemplated will require $50,000. Among these will be a building for a combined machine and blacksmith shop, several other buildings, and an addition to the mill. The hoist and buildings on sites over the hanging wall are being moved to the foot-wall side of the vein. Re-timbering the Golden Rule shaft and straightening the Jumper shaft is in progress. The Jumper Mining Co. has been reorganized, several of its members, however, having been identified with the former company. ——About 30 men are employed at the Mazeppa mine. The mill is being overhauled and a new track to this plant completed. A crew in the mine is cleaning drifts and stopes and making other preparations for mining. It is said to be the intention to erect a larger mill. The proposed crushing plant will be on Woods creek, several hundred feet distant from the present one.——Development of the Empire mine, on Mormon creek, is progressing and prospects are encouraging. Two ore-cars and 1000 ft. of rails have been purchased for the property.——Mining operations have been discontinued at the Draper, near Soulsbyville, which for the last two years has been worked by Cotton & McCormick, the owners. The pumps are still in operation, but whether mining will be resumed by the same operators cannot be learned.——Additional men have been put to work at the Black Oak mine re-timbering the shaft, which will be sunk another 100 ft. It is reported that work has been resumed at the Basin mine, south of Confidence.——The work of extending the drift on the 400-ft. level of the Dutch mine, at Quartz, to connect that property with the Sweeney, is in progress.——The suit of John Daves v. Frank Daves, et al., involving ownership of the Basin Chief mine, in Basin district, has been decided in favor of plaintiff. Litigation commenced soon after a rich find was made a few months ago, when ore assaying from a few dollars to $1000 per ton, was uncovered.

Tuolumne, August 5.

COLORADO

During July, the five largest mining districts of the State, Leadville, Cripple Creek, San Juan, Ouray, and Clear Creek, shipped nearly $2,000,000, Cripple Creek alone outputting $1,224,935, and Ouray, $275,000.

CLEAR CREEK COUNTY

(Special Correspondence).—During the past ten days 150 miners and prospectors have gone into the new goldfield at Beshears.——An electric drill has arrived for the Reliance Gold Mines Corporation. A transmission line is being run to connect with the United Hydro P. & E. Co. line.——The Ruler mine on Griffith mountain, has been leased by Charles Roland, of Syracuse, N. Y. Work will begin by September 1. N. Williams will be manager.——F. Nelson, manager for the Bard Creek M. Co., has bought a Leyner compressor and drills.——G. J. Hite has sold the Spanish claims on Columbia mountain to S. D. Sigafoos, and others, of Denver.——The Scotia mill at Silver Plume is running steadily and a large tonnage of lead and zinc concentrate is being finished.——Machinery has been bought for driving of the lower adit on the Gambetta property, on Republican mountain.——Larger shipments are being made by the Banner Con. M. Co., to the North American S. & M. Co. ——F. Seroy has discovered mica in Squirrel gulch. The sheets are from 12 to 18 in. square.——Machine-drills are running at the face of the Oneida adit at Freeland. A streak of ore 18 in. wide in the breast assays $60 per ton gold and silver.——The Holland adit at Lamartine is in 700 ft. and going ahead.——Ore 30 in. wide has been cut in the east drift of the Kentuck, operated through the Central adit.——A pump that will handle 50 gal. per minute is being placed in the Clifford mine up Fall river.

Georgetown, August 6.

GILPIN COUNTY

(Special Correspondence).—A number of small veins and stringers of ore have been penetrated in the Newhouse tunnel since the south vein of the Gunnell group was reached. Within 30 days the heading will have passed through the entire Gunnell holdings.——A compressor and machine drills have been installed at the Blue Bell mine. The shaft is down 300 ft., but will be sunk 200 ft. deeper.——The Cumberland M. Co. has started shipments. Tests show from $400 to $600 per ton in gold and silver.——Shipments are also being made from the West Whiting mine on Gunnell hill, to the Star mill for concentration. Smelter shipments return $60 per ton in gold.——The new machinery at the General Jackson mine is in operation.——The shaft on the British mine, down 220 ft., is to be sunk 200 ft. more. The new machinery is running.

Central City, August 6.

LAKE COUNTY

During July the mines of Leadville shipped 70,000 tons of ore. Never since the early days of the district have there been so many new shafts sinking as at present. This activity extends from the vicinity of Prospect mountain, on the north, to beyond Iowa gulch on the south, and from the Mosquito range to Sugar Loaf. There is unusual activity upon the Mosquito range both on the Leadville side and on the Park county side.

The output of the Cripple Creek district for June was 51,821 tons, valued at $1,224,[illegible], which was a small decrease from the production of June, attributed to the closing of important mines. [illegible] the Vindicator), a greater number of mines were in operation during the latter days of the month than usual.

Following are the figures of months' treatment at mills and smelters:

	Tons	Average Value	Gross Value
Smelters	[illegible]	$[illegible]	$[illegible]
Golden Cycle Mill	[illegible]	[illegible]	[illegible]
U. S. R. & R. Co.	[illegible]	[illegible]	[illegible]
Portland G. M. Co.	[illegible]	[illegible]	[illegible]
Portland New Mill	[illegible]	[illegible]	[illegible]
Gaylord Mill	[illegible]	[illegible]	[illegible]
Wild Il Mill	[illegible]	[illegible]	[illegible]
Total's	51,821		$1,224,[illegible]

IDAHO

SHOSHONE COUNTY

(Special Correspondence.)—Reports to the management at the annual meeting of shareholders of the Snowstorm Mining Co., at Larson, show the mining and shipping of 91,308 tons of ore during the year ended June 30, 1920, the average value of which was 6.90[illegible] oz. silver, and 4.067% copper per ton. The silver was marketed at an average of 52.208c per oz., and the copper at 12.954c per lb. The receipts from all sources, including a surplus of $46,402.45, and the estimated value of ore in transit, amounted to $507,473.29. Operating expenses and exploration and improvements cost $264,210.68. The dividends paid during the year amounted to $179,940, with a surplus of $63,322.61 on July 1.

It is reported the Reindeer mine near Mullen is to become one of the steadiest producers in the Coeur d'Alene district. The Reindeer has large ore reserves, and with a crusher and hand jigs the ore can be concentrated to a percentage of copper that will justify shipping. Ore production can be started on a small scale, and gradually increased.

Development is being done on the Rex mine, formerly the 16 to 1, three miles from Wallace, worked under lease by the Silver-Lead company. There is an abundance of ore blocked out and a mill is being put into shape to handle a large production. It will be ready inside of 60 days. The largest quantity of the ore lies below the 3200-ft. tunnel. From the tunnel a 600-ft. shaft has been sunk on the ore-body, and the shoot has been opened at all the levels from that. Forty men are working on the mill and in the mine.

Caledonia Mining company, operating in the Coeur d'Alene, announces that it will stop dividends for some time, now that the original stockholders have received their money back. All income from shipments will be used in running a tunnel, to put in a mill, and generally developing the mine. It is said that the reduction in cost of handling ore by a lower tunnel will be at least $2 per ton. Meanwhile, the production of 1000 tons per month is to be kept up.

Work has been resumed on the Original Ajax Mining Co.'s property on Nine Mile creek, near Wallace, after a shutdown of six months. A contract has been awarded for 150 ft. of driving on the lode, though the owners expect to get under the ore-shoot inside of 100 ft. J. W. Gilson, one of the owners, says the ore runs up to $18 per ton, mostly in silver. Work is being pushed from the lower tunnel, which cut the lode at a distance of 276 ft., but no driving to the ore was done at the time.

Spokane, August 3.

MISSOURI

JASPER COUNTY

Morris & Co., operating a hand-jig in the Kansas City bottoms on the new Union depot site, made a turn-in last week of 3150 lb. of dry-bone to the Picher Lead Co., the ore being worth $32 per ton. Previous turn-ins of dry-bone, or low-grade lead, have been made from the Union depot [illegible] since the work of excavation was started. The [illegible] Construction Co. [illegible] to mine the ore from [illegible] & Hutchison, who have the contract for the excavation of the Union depot site. The ore is found at shallow levels in the vicinity of former mining operations. The percentage of ore to the dirt dumped is small but owing to the [illegible] expense of washing it the product can be handled at a profit.

MONTANA

MEAGHER COUNTY

(Special Correspondence.)—The Keating Gold Mining Co. at Radersburg has a new electric plant and a working [illegible] factories. A favorable smelting agreement has been made with the East Butte Copper Co. and regular shipments are being made to that smelter. The ore averages $[illegible] in gold.

Radersburg, August 4.

SILVER BOW COUNTY

(Special Correspondence.)—Officers of the Anaconda company at Butte still insist that no policy of curtailment of copper production has been put into effect in Butte, and that, so far as they know, none will be. However, the July production was 7,000,000 lb. below the normal output of the Butte district. The normal average for some years has been 28,000,000 lb. per month. The production of the Clark smelter has been entirely eliminated by the closing of that plant. The Great Falls smelter of the Anaconda company, which has been producing in excess of 8,000,000 lb. has dropped under 7,000,000, but the Washoe smelter, handling all of the Anaconda, Butte Coalition, North Butte, and Clark mine ores, has not reduced its production. John D. Ryan is expected in Butte shortly. It is understood among Western copper men that an agreement to curtail production was reached at the London conference, and is being put in force gradually. In addition to the curtailment in Butte, it is announced that Calumet & Hecla, Utah Copper, Nevada Consolidated, and the Phelps-Dodge interests in this country, and Rio Tinto and other European producers will act in line with the London agreement. J. P. Morgan, and his associated financiers, are the real power behind the copper curtailment movement; they recognize that an unsettled copper market has had a pernicious effect on the general business interests.

The Butte Central Copper Co. is driving on the Ophir south vein on the 500-ft. level with encouraging results. Shipments will be made to Denver and Salt Lake to determine the character of mill that will be necessary for treating it, as it is the purpose of the company to erect a concentrator as soon as that question is settled.

The East Butte Copper Mining Co. is running its smelter chiefly on custom ore. The East Butte instead of mining its own ore during the low metal market, is accepting all the custom ore offered and reserves its own ore until copper is higher. In view of the fact that the East Butte company has been making a monthly profit for more than a year, the company has violated the laws of the State by neglecting or refusing to make a report to the authorities as to operating expenses and net profits. All other operating companies in the district have complied with the law.

Butte, August 7.

NEVADA

CLARK COUNTY

(Special Correspondence.)—The water supply of the Quartette company has increased and the mill is again operating at full capacity. Good ore is being developed in the lower level.——The Eldorado Crown has purchased a cyanide plant. The mill has been treating considerable ore, and the tailing often runs as high as $15 per ton. Most of this will be recovered by cyanide.—The Pompeii company announces that it will resume milling.——The Santa Fe has recently encountered several bunches of rich quartz, and plans the installation of pumps and the sinking of the shaft.—The Chief of the Hills lease has installed a gasoline hoist and is opening good ore.——The shaft of the New York-Searchlight is being placed in first-class shape

and equipped with new guides. As soon as the new machinery is in place the shaft will be sunk to 500 ft.——The Gold Star company will install a gasoline hoist. This company is entirely composed of negroes.——The Lirigo Mining & Milling Co. has been organized to operate a group of gold, silver, and tungsten properties at Camp Signal. J. F. Main is general manager.——The Monte Cristo company has also been organized to mine in this district.

Searchlight, August 3.

STOREY COUNTY

(Special Correspondence).—Fire in the top works of the Belcher mine at Gold Hill this afternoon completely destroyed the plant, and did some damage to timber-sets in the upper portion of the shaft. No one was injured, as the men had left the mine a short time before. Damage is estimated at over $25,000.

Virginia City, August 9.

Development at the north-end mines on the Comstock continues favorable, with an improvement on the 2400-ft. level of Mexican. In Ophir the 2000-ft. level will give about the same extraction of ore from the understope in the southwest drift. On the 2300 in the raise started last week the ore continues, and is of good grade. On the 2400 in the southwest drift, sill floor sets are being put in. In the Mexican in the north drift from the east cross-cut a streak of ore on the east side was cut giving good assays. The ore is widening and assays show improvement.

The pumping operations are being advanced as rapidly as possible at the C. & C. shaft. It is thought that it will require at least two more lowerings of the big hydraulic lift in order to pump the shaft out to the sump at the 2650. That the end is in sight is indicated by the fact that the water being raised now is filled with muck and is very dirty. Thus far it is being readily handled by the pumps. In a short time it will be possible to go into the 2650 station.

There is no change of note in Con. Virginia, the stoping of low-grade ore from the 1750 and 1800 levels being under way as usual. At the Hale & Norcross ore of good grade is being stoped and the first shipment to the mill was hoisted through the C. & C. shaft a few days ago.

NYE COUNTY

(Special Correspondence).—A large force is employed building foundations for the compressors, hoist, and ore-bins at the Belmont shaft. The shaft has been enlarged to 3 compartments to within 240 ft. of the surface, and it is expected to finish it within two months. The main vein has been opened for nearly 700 ft. on its strike, and 400 ft. on the dip. It has an average width of 15 ft.——A diamond-drill at the 800-ft. station of MacNamara will drill a down-hole 1000 ft. to prospect the formation. No attempt is being made to develop the recently intersected vein.——The south cross-cut from the 270-ft. level of Tonopah Extension has intersected the vein and shows 5 ft. of milling ore. The west foot-wall drift from the 400-ft. level is progressing rapidly and is expected to connect with the old west workings within a few days.——The Montana-Tonopah is continuing to make semi-monthly shipments of bullion valued at approximately $16,000. The mill is operating steadily, treating 990 tons per week.——The Transvaal of Nevada mine, near Rhyolite, has been leased by C. S. Coleman, of Los Angeles, and a small crew put at work. The vein on the 50-ft. level is being prospected.——Lessees on the Diamond are opening a 2-ft. vein averaging $10 to $35 per ton. A recent shipment of 30 tons was made to the Murray smelter. The ore is being mined on the 300-ft. level. ——The Shively & Bennett lease, and the Gingles & Vucovich lease on Tramp Con., report streaks of rich ore several inches wide. In the latter lease the rich part is 6 in. wide and consists of white quartz.——The warring factions of the Manhattan Dexter have adjusted their troubles, and a new company, independent of the Dexter, will be formed to operate all the leases.

Tonopah, August 6.

WHITE PINE COUNTY

(Special Correspondence).—W. A. Clark says he has no present intention of building a branch of his Salt Lake railroad into the Ely district. He admits that the matter has been talked about, and that even a survey has been made, but aside from that nothing has been done, and for the present nothing will be done. The road would be used chiefly to transport ore from the Giroux mines to the Tooele smelter of the International Smelting & Refining Co., and it is understood that the International interests will be associated with Mr. Clark in the building and ownership of the road.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence).—The management of the Socorro mines has decided to install another Harvey-Steele tilting furnace, the present equipment being inadequate owing to the increased production. This week 1400 lb. of refined gold and silver was cast into bars weighing 100 lb. each. The vein on the 600 west has widened to 12 ft. The width is 23 ft. where last cross-cut on 600 east. This, the lowest level, is furnishing the best average grade ore coming from the mine.——The Ernestine mine and mill are in full operation.——Lumber for the mill at the Deadwood mines is being delivered as rapidly as possible. Grading is well under way. Considerable building material is loaded out from Silver City and should arrive during the week. Construction will be pushed as fast as deliveries will permit. ——Arrangements have been perfected whereby work will be started on the various holdings of the Mogollon G. & C. Co. within 60 days.——In addition to the work in the main tunnel of the Enterprise Mining Co., a winze has been started in the second level.

Mogollon, August 5.

UTAH

BEAVER COUNTY

The Frisco Consolidated Mining Co., owning property on what is supposed to be an extension to the Hornsilver vein, is about to begin prospecting extensively. Already 1500 ft. of development has been done. In one of the prospect shafts 30 in. of good ore was found at a depth of 130 ft. The ore carried argentiferous lead to the value of $50 per ton.

WASHINGTON

STEVENS COUNTY

(Special Correspondence).—Fires in and around the Deertrail mines have destroyed considerable valuable mining timber. The bunk-house and post-office building at Deertrail were destroyed and fire is raging in the vicinity of the Seal and Queen mines, and near Germania tungsten mines, which is two miles distant from the Queen. There are 75 men working at the tungsten property, part of whom are fighting the fires.

FERRY COUNTY

(Special Correspondence).—Robert Maboy, Thomas A. White, L. W. Anderson, J. W. Lloyd, and others, have leased and bonded the Knob Hill and Mud Lake claims, at the head of Eureka gulch, in Republic camp. The Knob Hill was worked for 12 years and has produced some good ore. The lessees are opening that claim from the east side of the hill and have driven from a 35-ft. cross-cut adit 25 ft. on a vein from 3 to 4 ft. 8 in. wide and are getting ore which assays $146 per ton across the widest part, and some assaying as high as $300 per ton. About 40 tons of ore are ready for shipment. A new cross-cut adit, now in 60 ft., will be driven 180 ft. to the vein at a vertical depth of 200 and 300 ft. on the dip. The lessees will shortly incorporate. Fourteen men are employed on three shifts. ——The Pacific Ore Co. has partly completed the frame work of a 100-ton cyanide mill at Republic. When finished the mill will have four floors. The ore-bin will have a capacity of 125 tons. A Gates crusher, three Chilean mills, with feeders, and an automatic sampler will be among the equipment.——The lessees of the North San Poil mine have drifted from the turnsheet in the lower San Poil adit 455 ft., following the vein the most of that distance. The drift is getting into the pay-shoot, which shows some very good ore.——A large tonnage of iron sulphide will be shipped

[illegible] the Cariboo Key [illegible] as the Standard Lead & Northern [illegible] from the mouth of Lightning creek.

CANADA

The report of the Minister of Mines of the Province of British Columbia states that the production for the year ended December 31 last amounted to $24,443,025, an increase over the preceding year of $491,748. The total tonnage was over 2,065,[illegible] tons, the mines of the Phoenix district contributing about [illegible] of this.

The ore shipments from Rossland district for the week ended July 30, and for the year to that date, were as follows:

	Tons	
	Week	Year
Centre Star group	1,560	111,392
Le Roi	470	8,628
Le Roi 2, Ltd (part conc.)	540	17,889
Velvet	31	245

Rossland, August 6.

The production of metal at the Trail smelter and refinery of the Consolidated Mining & Smelting Co. of Canada, Limited, was $5,911,767 for the year ended June 30, 1910. This was an increase over the preceding year of over $400,000. The following table shows the production for the year, including the month of June:

	June	Year.
Gold	$248,321	$2,811,676
Silver	76,890	1,134,881
Copper	63,608	779,230
Lead	102,211	1,182,980
	$491,030	$5,911,767

Ore shipments from Phoenix and the Boundary district for the week ended July 30, and for the year, to that date, were as follows:

	Tons	
	Week.	Year.
Granby group	20,721	712,213
Jackpot	679	3,901
Mother Lode	6,800	200,300
Oro Denoro	289	7,375
Snowshoe	2,130	102,717

Phoenix, August 1.

The shipments of ore and concentrate from the Slocan-Kootenay district for the week ended July 30, and for the year to that date for the mines named, were as indicated in the following table:

	Tons	
	Week.	Year.
Eastmount	35	485
Emerald	29	1,124
Queen (conc.)	39	383
Queen Victoria	138	2,046
Richmond-Eureka	31	2,539
St. Eugene (conc.)	191	9,773
Sullivan	288	7,690
Yankee Girl	129	3,249
District milling	5,000	158,000

Slocan, August 1.

ONTARIO

On the 100-ft. level in the northwest cross-cut, 20 ft. from No. 1 vein, the Temiskaming & Hudson Bay Co. has struck a new vein that recalls memories of the first days in Cobalt when silver was picked up off the ground. Never in the history of this mine, which holds the dividend record of the camp, has such ore been found underground. The new vein is 10 in. wide and is well over 50% silver by weight. A poor sample that did not contain so much free silver was shipped out for assaying and went over 6000 oz. per ton. The find is 20 ft. in the cross-cut beyond No. 1, which was an 18-in. vein of 4000-oz. ore. From the cross-cut 101 bags of very rich ore was taken. The drift has been driven 20 ft. on it and it holds good. To date this company has paid $166 on every dollar invested, or 16,600 per cent.

Personal

[illegible] such are invited to send items of their doings [illegible] and travels. Such items are interesting to [illegible]

S. J. Speak is in Australia.

S. H. Ball has gone to Siberia.

S. S. Howe has gone to Montana.

W. H. Weed was in San Francisco.

C. R. McCullom is in San Francisco.

Whitman Symmes has been in San Francisco.

Ralph Arnold was in San Francisco this week.

Sumner S. Smith is in Shasta county, California.

A. G. Carrigan is now at Mina Boston, Costa Rica.

E. B. Webster is now at Vancouver, British Columbia.

H. Van Manning is chief clerk of the U. S. Bureau of Mines.

C. W. Hayes is expected in Los Angeles, returning from Mexico.

F. W. Bradley has returned to San Francisco from Alaska.

Donald Steel, of Ithaca, N. Y., will spend a couple of years in Africa.

Bertram Hunt has gone to the Jewel mine, Greenwood, British Columbia.

Francis Drake is out of the hospital and has gone to Boyes Springs, California.

Ross B. Hoffmann returned from British Columbia and has gone to Denver, Colorado.

J. A. Holmes is organizing the work of the new rescue stations of the U. S. Bureau of Mines.

E. A. Jackson is vice-president and general manager for the North California Mining Company.

O. H. Packer has returned from the Minaret mountains, where he has been examining iron ore deposits.

F. D. Baker is chief engineer of the Colorado Department of the American Smelting & Refining Company.

R. S. Handy is now superintendent of the concentrating mills of the Bunker Hill & Sullivan M. & C. Co., Kellogg, Idaho.

George S. Rice has declined a proffered position with the T. C. I. & R. Co. and will remain with the U. S. Bureau of Mines.

C. T. Durell will sail from Victoria, August 17, for the Far East. He is to be manager for the Headwaters Mining Co., Baguio, P. I.

A. H. Brooks sailed from Seattle, August 8, for Alaska. He will go to Matanuska coalfield and later will visit the mining districts of southeastern Alaska.

Clifton H. Wildman has resigned as manager for the Morning & Evening Star M. & M. Co., at Ward, Colorado, and gone to Norwalk, Ohio, to recuperate from a severe attack of rheumatism.

George Otis Smith has gone to Stockholm, Sweden, to attend the meeting of the International Geological Congress, August 18 to 25. Other representatives of the Geological Survey will be Waldemar Lindgren, George F. Becker, S. F. Emmons, and Whitman Cross.

OBITUARY

George Riley, Sr., who was one of those killed in the railway wreck near Ignacio, California, August 8, was well known to the mining profession, having been connected with the business department of various technical papers on the Pacific Coast. He had but recently severed his connection with the *Pacific Rural Press*. Mr. Riley was 55 years of age at the time of his death. He leaves a widow and two children, George Riley, Jr., and Mrs. Robert N. Lynch, to whom will go the sympathy of a widely scattered circle of friends among mining men and machinery manufacturers.

GOLDFIELD CONSOLIDATED FOR JULY

Following is the preliminary report of operations of the Goldfield Con. Mines Co., for July, 1910, as submitted by J. R. Finlay, general manager:

TONNAGE PRODUCED

	Wet Tons.	Dry Tons.	Ounces per Ton.	Gross Value.
Combination	5,250	4,858	1.13	$113,124
Mohawk	7,664	7,092	1.16	169,545
Red Top	3,999	3,700	1.56	119,288
Clermont	6,652	6,155	3.38	428,677
Total	23,565	21,805	1.84	$830,634

The performance of the mill was as follows:

Dry tons milled	21,805
Value per ton (average)	$38.10
Total value	$830,634
Loss in tailing	$49,619
Total realized	$781,015
Percentage extracted	94.03

General expense—	Amount.	Average per Ton.
Bullion tax and marketing bullion...	$15,000	
Administration, etc.	17,000	
	$32,000	$1.47
Mining	80,000	3.67
Transportation	2,800	0.13
Milling and cyaniding..... $55,200		
Marketing concentrate residues 12,000	67,200	3.08
Construction	25,000	1.15
Net cost	207,000	9.50
Loss in tailing	49,619	2.28
Total costs and losses	$256,619	$11.78

Profit per ton, $26.32; total value of ore, $38.10; total profit, $574,015; total profit, percentage, 69.11.

Operations were hampered in July by shortage of water for milling. The mine and mill were both ready by July to continue production at full capacity, but during the month the water received was only two-thirds that available in March. By using the spent cyanide solutions in the batteries instead of fresh water, it was possible to get through about 85% of a full tonnage, but this practice is not metallurgically good. Both costs and losses were increased over what they should have been. Discoveries of new ore were few during the month. The total advance in development was 2520 ft. New ore was taken from main levels as follows:

	Level.	Tons.	Oz.
Combination	230	200	0.75
Mohawk	450	90	1.87
Clermont	600	405	0.60
Red Top	750	270	0.75
		965	0.97

COPPER PRODUCERS ASSOCIATION FIGURES

The monthly report of the Copper Producers' Association, made public August 8, shows copper stocks on hand August 1 were 170,640,678 lb., as against 168,386,017 July 1, an increase of 2,255,661. July production was 118,370,003, as compared with 127,219,188 in June, a decrease of 8,849,185 lb. Total deliveries in July were 116,115,342, as compared with 119,259,144 in June, a decrease of 3,143,802 lb. Of the deliveries, 56,708,175 lb. were for domestic consumption and 59,407,167 were for export, domestic deliveries showing an increase of 3,344,979, while deliveries for export decreased 6,488,781 pounds.

Market Reports

LOCAL METAL PRICES.

San Francisco, August 11.

Antimony	12—12¾c	Quicksilver (flask)	46½—47
Electrolytic Copper	14½—15½c	Spelter	7—7¼c
Pig Lead	4.70—5.65c	Tin	35¼—36¼c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter	Silver, per oz.
Aug. 4	12.44	4.40	5.29	52¼
" 5	12.44	4.40	5.29	52¼
" 6	12.44	4.40	5.29	52⅞
" 7	Sunday.	No market.		
" 8	12.44	4.40	5.29	53
" 9	12.44	4.40	5.29	52⅞
" 10	12.44	4.40	5.29	52⅞

ANGLO-AMERICAN SHARES.

Cabled from London.

	Aug. 3. £ s. d.	Aug. 11. £ s. d.
Camp Bird	1 7 6	1 7 3
El Oro	1 5 6	1 6 6
Esperanza	2 13 9	2 16 10½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 3	0 6 3
Mexico Mines	8 12 6	8 12 6
Tomboy	0 16 3	0 16 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Aug. 11.		Closing prices, Aug. 11.
Adventure	6	Mohawk	59¼
Allouez	39½	North Butte	27¼
Atlantic	6	Old Dominion	37
Calumet & Arizona	56	Osceola	130
Calumet & Hecla	530	Parrot	15
Centennial	18	Santa Fe	1⅛
Copper Range	65½	Shannon	10½
Daly West	6⅞	Superior & Pittsburg	12
Franklin	10	Tamarack	57
Granby	33½	Trinity	6½
Greene-Cananea, ctf	7½	Utah Con	24
Isle-Royale	18½	Victoria	2½
La Salle	10½	Winona	8½
Mass Copper	7½	Wolverine	120¼

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Aug. 11.		Closing prices, Aug. 11.
Amalgamated Copper	58	Miami Copper	21¾
A. S. & R. Co	66¾	Mines Co. of America	⅛
Boston Copper	18⅜	Montgomery-Shoshone	7/16
B. C. Copper Co	4⅛	Nevada Con	20⅛
Butte Coalition	19⅞	Nevada Utah	⅜
Chino	12¾	Nipissing	10⅞
Davis Daly	1¼	Ohio Copper	1⅝
Dolores	6	Ray Central	2⅜
El Rayo	3¾	Ray Con	18½
Ely Central	1	South Utah	1¾
First National	3½	Superior & Pittsburg	12⅛
Giroux	7⅜	Tenn. Copper	24¼
Guanajuato Con	1¼	Trinity	6½
Inspiration	7⅞	Tuolumne Copper	2⅜
Kerr Lake	7¼	United Copper	4¾
La Rose	3⅞	Utah Copper	46½
Mason Valley	6⅞	Yukon Gold	3⅞

SOUTHERN NEVADA STOCKS.

San Francisco, August 11.

Atlanta	$ 15	Mayflower	$ 3
Belmont	4.35	Midway	26
Booth	15	Montana Tonopah	88
Columbia Mtn	7	Nevada Hills	2.40
Combination Fraction	53	Pittsburg Silver Peak	55
Daisy	6	Rawhide Coalition	14
Fairview Eagle	35	Rawhide Queen	26
Florence	2.45	Round Mountain	44
Goldfield Con	8.50	Sandstorm	4
Gold Kewenas	8	Silver Pick	9
Great Bend	3	St. Ives	20
Jim Butler	29	Tonopah Extension	83
Jumbo Extension	63	Tonopah of Nevada	8 37½
MacNamara	30	West End	63

(By courtesy of San Francisco Stock Exchange.)

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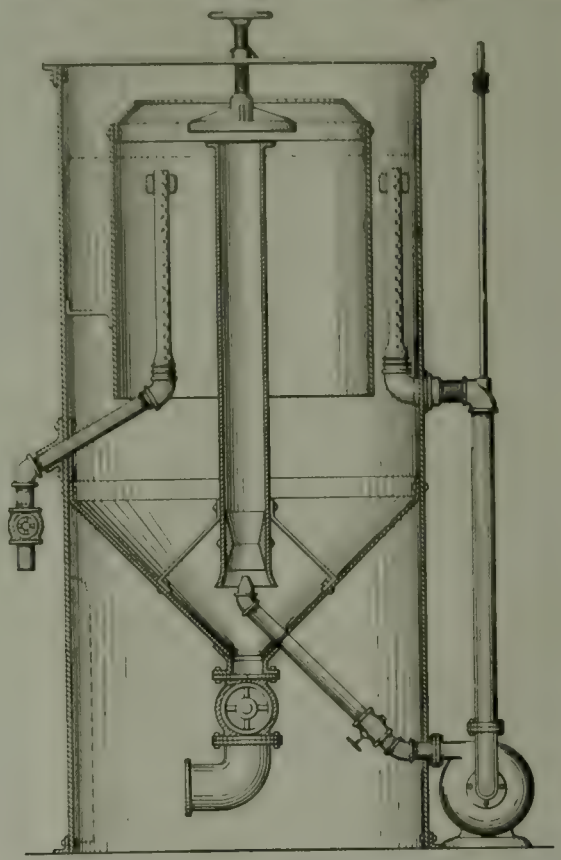

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EDITORIAL

THE COLONEL, it seems, cannot come to Los Angeles to attend the Mining Congress. All we have to say to that is that he is going to miss "a perfectly corking good time."

THE date of the dinner of the Mining and Metallurgical Society at Los Angeles has been changed to September 29. An excursion along the line of the aqueduct is also planned. Mr. Seeley W. Mudd is in charge of arrangements.

DIAMOND prospecting in Rhodesia is expected to be stimulated by the action of the courts in confirming the validity of the agreement entered into in 1892 between the Chartered Company of South Africa and the De Beers Company. Under this agreement the latter was granted a license to work all diamantiferous deposits in both north and south Rhodesia. Confirmation of this grant will, it is thought, result in the finding of new diamond fields.

THROUGH train service on the new Western Pacific railway is to be established August 22, and the event is to be properly celebrated by a number of California cities. The new railway line will have advantages in competition in the matter of low grades, and has been built most substantially. With completion of improvements planned for its Eastern connection, the Denver & Rio Grande, it will become an important factor in the freight situation of the West. As a tourist route, it is assured of popularity from the start.

PROMPTNESS in publishing reports is not characteristic of Government Bureaus. By some method not known to his fellow workers, Mr. Willet G. Miller, provincial geologist of Ontario, has frequently found means to overcome the difficulties and to issue reports and maps at the time they were most needed. Another instance of his enterprise is evidenced in the abstract we present elsewhere, of a report on the Porcupine district, just published. The report and map have been issued less than three months after the beginning of the field work, yet no one familiar with Mr. Miller's work at Cobalt and elsewhere will doubt the accuracy and value of the report. The latter, while brief, as befits an advance statement, is sure to be as helpful as it is welcome. Tennessee as well as Ontario is enjoying the benefits of prompt publication of geological survey results. Mr. G. H. Ashley is already distributing Bulletins 1 and 3 of the new State Geological Survey, and excellent bulletins they are. We hope such commendable enterprise may stimulate others to like promptness.

ANNOUNCEMENT was made some months since that a merger of the mines along the Comstock Lode in Nevada was about to be accomplished. The plans of the projectors, however, fell through. One curious phase of the matter was that stocks fell rather than rose when the merger was announced. There is no question that under strong engineering and financial management the prospects for mining would be greatly improved. In 'Comstocks,' however, there has long been no very direct relation between mine and certificate, and under the proposed consolidation, the opportunity for 'rigging the market' would be materially lessened. The value of the shares to speculative holders therefore fell, and much stock was dumped on the market rather than deposited under agreement. The one thing San Franciscans did not want, was a consolidation that would limit speculation. The reform administration of the City did away with slot machines, and the people remained passive; but to interfere with time honored manipulation of Comstocks, was going too far. On the other hand, the New Yorkers seemed willing enough to assume management, but not to buy stock. The net result has been a considerable change in ownership which still, however, remains largely in San Francisco. Efforts are being made to bring existing companies close together and to effect needed reforms at the mines and on Bush street. How successful these will prove is uncertain.

STAMPS are again doomed to extinction. Mr. Mark R. Lamb, in an interesting and thoughtful paper presented to the American Institute of Mining Engineers, argues that the days of the gravity stamp in cyanide plants are numbered, and calls attention to the frequent disposition to substitute cyanidation for amalgamation even when rich free-milling ore is treated. Between steam-stamps for crushing large tonnages, and rolls for smaller amounts, the field of the gravity stamp is undoubtedly being narrowed. The development of steam-stamps suitable for moderate tonnages, a step already over long delayed, and the undoubted tendency to use stamps more as crushing and less as amalgamating devices, will still further limit their use. The gravity stamp, however, when it is at all usable, is so simple, effective, and adaptable, it is so well understood, demurrage with it is so small (relatively), and salvage in reconstruction so large, that it will always remain the great stand-by of the gold miner. There are some machines so simple that they are incapable of much improvement, and they hold their own against later, and in many respects superior, devices. Steam is powerful in ocean transportation, but sailing vessels still carry much cargo, and the shape and position of sails change little with the passage of centuries. Hoisting engines of increasing complexity and efficiency are built, but the homely windlass and simple horse-whim are as widely used as ever. A cordial welcome will be extended to the new steam-stamp and the best of good wishes go out to the perfecters of rolls, but we shall expect nevertheless to be soothed to sleep many a night by the welcome roar of the stamps.

TURKEY is attracting attention among European mining engineers and investors, and the question has been raised as to why Americans have not entered the field. The Ottoman Empire undoubtedly includes much undeveloped territory in which important mineral resources exist. Foreign capital and technical skill will be needed to convert the existing prospects into mines. Many of those who have lived in Asia Minor have high respect for the Turks as individuals, but their bad government has become a by-word. Under the present regime great improvement is to be expected, but the country is old and the people are conservative. An American mining engineer finds his way beset with difficulties not met at home or in Mexico, and so long as good opportunities remain open in North America our participation in Near-Eastern affairs is apt to be slight. With the profits won at home and the experience and money acquired in Mexico, Americans will more probably interest themselves in South America when nearer fields become crowded.

Foreign Trade and Ownership

With remarkable regularity, the always interesting *Daily Consular and Trade Reports* lectures American manufacturers and exporters on their failure to improve opportunities for foreign trade. We are so accustomed to hearing of our short-comings in the matter that we would be quite cast down except that even a limited acquaintance with the subject reveals the fact that English and German manufacturers and exporters come in for the same lectures from their Consuls and expatriated critics. After having been thoroughly convinced that the crass stupidity of our own merchants has lost us magnificent commercial opportunities in Korea and Manchuria, to the great gain of those of Great Britain, it is disconcerting to read in the letters of English travelers, how British trade in the Orient is being steadily displaced by the shrewd Yankees and ubiquitous Germans. It is scarcely less discomfiting after having become finally reconciled to our complete extinction before the Teutonic advance, to hear the mournful wail that comes from the Vaterland to the effect that 'the knell of German shipping in the East has been sounded by the Japanese.' Many Japanese steamers, it happens, are built with British capital, and the International Mercantile Marine is dominated by an American house. When much ado is made over the inroads of the Germans in sales of electric machinery in South Africa, it is well to remember that the Allgemeine Elektricitats Gesellschaft and the General Electric Company do not sound very different when translated into the same language. The truth is that international trade is itself international. No nation may expect a permanent monopoly and trade cannot be long maintained along artificial lines. If we would sell, we must expect to buy. At times direct exchange is feasible and profitable. At other times an indirect course brings better returns. In any event the profits are widely distributed and the ownership of a boat is by no means determined by the flag it flies as is quickly learned at the sea coast.

BY THE WAY

In the course of his Commencement Address at Madison Wisconsin Mr C R Van Hise president of the University, gave the following definition of the relations between the University and the State.

The strength of the State University lies in its close relations to the State. The State demands service, the University feels a peculiar obligation. It is the duty of the State University to instruct young men and women it is its duty to advance knowledge, and especially those lines of knowledge which concern the development of the State. It is the duty of the staff of the State University to be at the service of the State along all lines in which their expert knowledge will be helpful; it is their duty to assist in carrying knowledge to the people. These relations between the University and the State bind them closely together. The growth of the University is dependent upon the State. The State owns the University; and every citizen feels himself to be a stockholder in that ownership. But associated with these close relations, which are the strength of the State University, are also its most serious dangers. These are that the University may be politically controlled, and that it may be hampered in its work.

To the first of these dangers the State University is especially exposed in its youth. It speaks well for the democracy of this country that as the States have developed, the danger of political interference in university government has steadily become less.

The other danger of the close association of the University with the State—interference with its work—has two aspects; first, it may be demanded that the teaching which looks toward material ends shall be strong, while the humanities are allowed to remain weak or not properly developed, and second, freedom of teaching and investigation may be interfered with. The former is probably the more imminent danger for the majority of institutions. It is natural, indeed inevitable, that the people shall demand that effective teaching, research, and extension of knowledge shall be done in agriculture, in engineering, and in other lines from which a financial return may be shown from the investment. These demands are right and should be fully met by the University; but also the people should appreciate that all material gains are for men and women. Why do we wish to produce more wheat and cotton? In order that human beings may be fed and clothed. But, "The life is more than meat and the body is more than raiment." Shall the people demand of their University that it provide for their material needs and neglect the people themselves—their intellectual, artistic, moral, and spiritual development? The capacity of a State University to make the man himself, as a subject of study and advancement, maintain a paramount position will be the crucial test of the State University. The University authorities must insist that man shall not become subordinate to material gain. If the people will support a State University in which these ideals obtain, then can it be truly said that a democracy is a success.

The remaining danger of the close association of the State with the University is the possibility of interference with the freedom of teaching and investigation. If such interference occurs it is likely to be indirect rather than direct, and is therefore all the more insidious. A sentiment may be developed or a situation may arise in a State such that the professor feels he is not free to teach the truth as he sees it, and to quote a phrase, he may feel that he must 'shade the truth' somewhat.

For my own part, I have no doubt that in all the States in which the State Universities are strongly established the overwhelming majority of the people are in favor of absolute freedom of teaching and investigation. But frequently the deep-seated dominant sentiment does not express itself, and there are always some who would place limitations upon the field of a University. But a University must insist that the whole domain of physical and human phenomena belong within its scope—pure science, applied science, politics, morals, religion, are proper fields of study. In making this statement I do not mean to imply that the State University should dogmatize; but this is no more true of politics and religion than it is of agriculture. In no field should the method of the University be that of dogmatic teaching. The facts concerning any subject should be broadly dealt with; none should be hidden; their bearings should be considered with reference to the principles which flow from them; and always without bias. The attitude of the professor in reference to every subject should be that of a candid judge, not that of an advocate, but an absolutely free and fearless judge who feels heavily the responsibility of his position of trust. Shall the University be free to teach that a certain practice in agriculture is wrong and advocate a new and improved practice, and the same principle not apply in politics and in morals? Such a position would be intolerable. No institution which does not handle the humanities in all their amplifications under the same principles that it handles the pure and applied sciences is worthy of the name of a University.

In taking part in the work of advancement of the State, the staff of the University should be free from intellectual arrogance and devoid of any attempt to force their ideas upon the people. If the State gives freedom of teaching and investigation to the University staff, also the people of the State should be free to accept or reject as their judgment may dictate. It is by the free contest of ideas and ideals, often widely diverging, that progress is made. It is self-evident that no man or group of men have the right to assume that they have a monopoly of truth. The staff of a University, above most groups of men, should recognize the complexity of the facts, the impossibility of arriving at the absolute, and so without fear and without bias, with firmness, but with profound humility, present their ideas to the world to be accepted if found good and to be rejected if found inadequate. It is incumbent that the Universities play their part in leadership. Times of unrest, of changing ideas and ideals, are above all, the times when the Universities should be most effective in the guidance of public opinion.

Top-Slicing Mining Methods at Cananea, Mexico

By Courtenay De Kalb

Many different methods are employed in mining at Cananea, owing to the varied characters of the orebodies. One of the most interesting is the adaptation of top-slicing in the Oversight mine, belonging to the Cananea Consolidated Copper Mining Co. Every application of caving systems of mining is in effect an adaptation to local conditions. The details

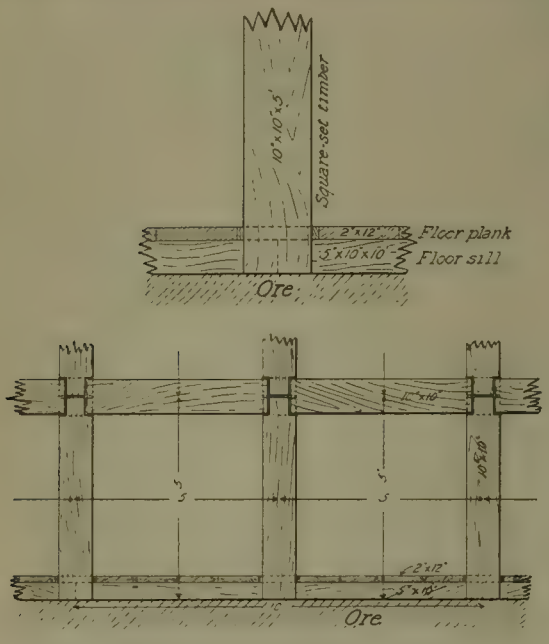


Fig. 1.

as developed at one property will not serve the needs at another without modification. The adaptation made at the Oversight by James Kirk, superintendent of mines, in collaboration with his brother, Harry E. Kirk, possesses some interesting features. The orebody is of quite irregular outline, its horizontal cross-section bearing some resemblance to the imprint of a bare foot upon the soil. The overburden, leached and highly altered, but having a tendency to settle in part as large unbroken blocks, varies from 150 to 900 ft. in thickness, and the outer rims of the orebody, locally termed 'shore-lines,' range from 75 to 500 ft. apart, horizontally. To a limited extent only are temporary chutes or ore-mills maintained for working the ore downward. Where many raises are driven the ground is thereby weakened, and the chutes must be placed so as to assist in the self-crushing of the ore-masses as they cave; in other words, they must be correlated with the method of mining. This would disarrange the top-slicing system. The temporary chutes are here never closer than 30 ft. The main chutes are of a relatively permanent character, leading to loading-bins on certain levels, whence the ore is hoisted to the surface.

The main levels are 100 ft. apart vertically, and the main haulage levels are at still greater intervals. For slicing, a series of intermediate levels are driven 10 ft. apart vertically, and the ground is further subdivided by parallel intermediate levels and by cross-cuts, approximately 50 ft. apart horizontally. The orebody is primarily explored by main longitudinal drifts, and by occasional cross-cuts, after which a contour-level, along the 'shore-line,' is advanced; and approximately parallel but straighter sub-levels block out the ground for slicing. Where the orebody is narrow a sub-level is driven along the longitudinal axis of the mass, and 'subs' are extended parallel to this at a convenient distance inside the wall or 'shore-line' to admit of shoveling the ore into cars from either direction, otherwise only half the value

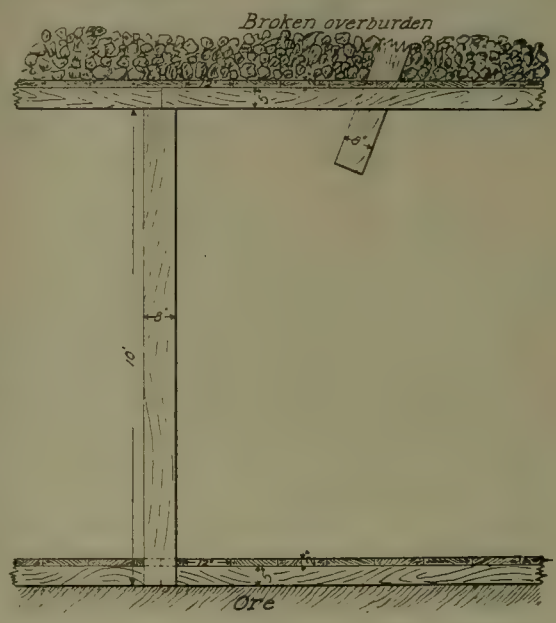


Fig. 2.

of the 'sub,' as a way for transportation, would be realized.

In starting work at a new point beneath the overburden, its irregularities need to be reduced to a plane for the successful application of top-slicing. This is achieved by mining out the necessary amount down to a feasible horizon by the square-set method.

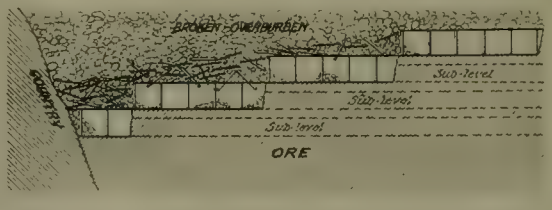


Fig. 3.

The posts, however, do not stand upon sills. If the ore beneath is exceptionally soft the posts rest on foot-plates. Sills are laid only to catch the flooring, the ends of the boards abutting along the centre lines of these sills. The object is to permit the burden to sink, but to maintain a good floor to prevent a spill. The burden will drive the posts below the floor-line as the ground beneath is mined, while the new posts set below hold up the floor-sills, and thus

preserve a quiet temperature and safe roof under which mining may be continued. This principle is persisted in throughout, and it has also proved economical of timber. The posts or stulls used in top-slicing consist of Texas round pine 8 to 10 in. existing sound-covered. The floor-pieces are 2 by 12 in. by 10 ft. long, and the floor sills are 6 by 10 in. by 16 ft. long. It will be seen that less timber is used where the planks abut on a 6 by 10 in. sill than where they are made to overlap, shingle fashion, as is commonly done. The sill not only economizes, so far as the overlap is concerned, but it takes the place of the head plates required in the other system when cutting up the floor from beneath. The method is shown in Fig. 1, which illustrates the square set system, and also the manner of placing the sills and flooring ready for the slice below. The manner of cutting up the floor-sill overhead is depicted in Fig. 2, which furthermore shows a stull or post being forced under its load through the upper floor into the space left by the succeeding slice below. The progress of slicing in successive steps is illustrated in Fig. 3, where it is seen that the slices advance with faces 50 ft. apart, receding from the run or 'shore line' of the deposit. The timber consumed by this method amounts to 13 ft. board measure per ton of ore extracted. Before top-slicing was introduced the consumption was 26 ft. The powder used in the Oversight mine averages 1 lb. per ton of output, and the labor efficiency shows 2.7 tons of ore hoisted per man employed.

GOLD MINING IN ALASKA, 1909

*Gold placer and lode mining in Alaska in 1909 showed marked progress in production as well as in preparation for larger operations. The production of gold was about $20,463,000, an increase of $1,170,182 (about 6%), over the output of 1908 and the largest yield since 1906, the year of greatest production.

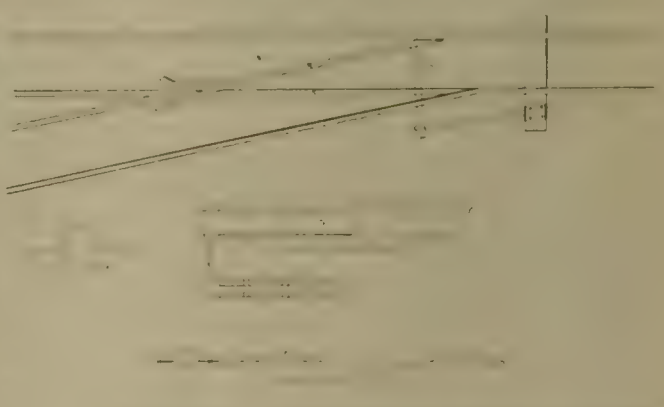
The placer production was $16,322,000; the lode production, including gold derived from copper ores, was $4,107,363. The figures representing the product of the same kinds of mining in 1908 were $15,888,000 and $3,357,335. The Yukon placers yielded their largest annual output in 1909. Practically all the Yukon camps made increased production, those of the Tanana valley leading with about $10,150,000. Of this amount the Fairbanks district produced $9,650,000. A further increase of production is recorded for the Koyukuk district and an important feature of the year's mining was the continued success of dredging in the Fortymile district. All the placer camps were prosperous except those of Seward Peninsula, where dry weather curtailed the output. In this region the methods of mining must evidently be adapted to meet the exigencies due to frequent seasons of low water. Important advances were made in dredging enterprises. The discovery of [illegible] placers at Ophir [illegible] Creek in the Iditarod district in the latter part of 1907 caused a movement of population in 1909 which promises to be important. Although the district can not support the large population it has acquired it seems to offer a promising field for exploitation. The output of the year in the Innoko is variously estimated at $300,000 to $400,000. During 1909 Alaska's auriferous lode mines produced gold valued at $4,107,363, an increase of $749,928 over the product of 1908 and the largest annual lode output yet recorded.

*Abstract from Bulletin 442, U. S. Geol. Survey.

A CHEAP AND EFFICIENT SPRING-SWITCH

By S. Clarke

A cheap and efficient spring-switch suitable for wyes and passing tracks can be made by any blacksmith at a small cost. The dimensions given in the figure below can be changed to suit conditions. The tie to which the sapling is fastened should be about 6 by 8 in. and placed 2 ft. 6 in. beyond the switch points. A hickory sapling, or any wood that is tough and springy, answers the purpose of a spring. The sapling should be 3 ft. 6 in. long and about 2½ in. diam. at the butt. Square the large end to 2 inches in order to make a snug fit in the clamp. The clamp is made of 4 by 6 by ⅜-in. iron bent in the shape shown. Set the clamp at a slight angle from the outer rail in order to get the sapling in a strain, lag-screw or spike the clamp to the tie. The switch points are connected to the frog leads by straps made of 2 by 16 by ¼-in. iron doubled to 8 in., with the end rounded enough to take a ¾-in. pin. The king-pin is 5 in. long and the head ¾ in. square, or nearly large enough to fill the space between the switch points and frog leads. The strap is bolted with ⅜-in. bolts, or riveted. The switch-rod for sapling and switch points is made of ¼ by 1½-in. iron, and forged as shown, with slots welded on to hold the points in place. The sapling is fastened to the end of the rod by a semi-circular collar 1½ in. diam., and bolted to the end of the rod with two

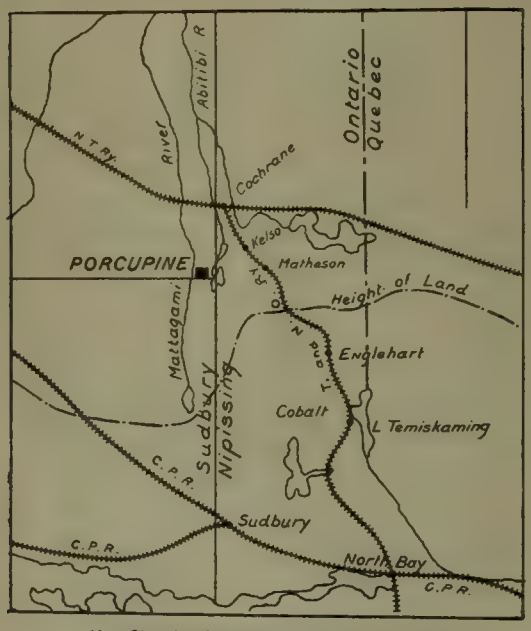


⅜-in. bolts. As the 'spring' of sapling is not always uniform, it is nearly impossible to give the distance that the sapling should be placed from the rail to get the best results. With straight flawless hickory it has been found that if the centre of the tie-clamp be placed 8½ in. from the fixed rail, and the collar on the switch-rod be placed the same distance from the switch points, the spring will work satisfactorily.

Porcupine District of Ontario

By Willet G. Miller

*The geological work which is summarized on this map was done in parts of the months of May and June, 1910. The map has been published as soon as the engravers could complete it. Doubtless errors have been made in the field work, but it was thought best to publish the geological map, imperfect though it may be, at an early period in the camp's development, rather than to wait until it would be of less service. Much of the area mapped is drift-covered and, upon the map, the drift is left uncolored. It entails more work to map an area such as this than one where the outcrops of rock are more continuous. It is not to be expected that all of the outcrops have been located, since many of them are small in size and occur here and there over a low, more or less swampy and densely wooded, surface. Moreover, the extreme eastern and the extreme western parts of the area, bordering on Night Hawk lake and the Mattagami river respectively, have not as yet been mapped in detail. During the present summer the geological field work will be extended and a new enlarged edition of the map will be published next winter. No attempt has been made to put all the names of the mining claims on the map. The names of several of the best-known working properties are shown.



Map Showing Location of Porcupine District.

Outcrops of quartz are very numerous in the area mapped. They are found both in rocks of Keewatin and Huronian age. The age of the rock, whether Keewatin or Huronian, does not appear to have any bearing on the character of the vein, either as to form or as to gold content. While the field work has not extended over a large enough area to include the granite mentioned above, I have little doubt that the quartz deposits of the Porcupine area are connected with the great granite intrusions which took place in post-Lower Huronian times. The quartz has been deposited from the impure waters, highly heated and under great pressure, which worked through the rocks after the granite intrusion.

At the time the field work in connection with the preparation of this map was in progress, development of the orebodies was only in preliminary stages, and facilities for the study of ore deposits were naturally not good. Moreover, it may be said that our object was to prepare a map for the use of the prospectors and to make a more detailed study of the orebodies later on. The detailed maps of Messrs. Knight and Burrows, which accompany this general geological map, show the occurrence of some of the important orebodies. It is seen, for instance, that the orebodies at the Timmins cut across the strike of the schist, and that they vary considerably in width from point to point. This is characteristic of practically all the orebodies in the area. They widen into large masses of quartz, in one or two cases from 75 to 100 ft. in width, and narrow abruptly. Mr. Knight, in the notes published with his detailed plan, refers to this, and compares this abrupt change to that which is frequently seen in granite pegmatite. The Foster vein, mentioned above, differs from the quartz veins or deposits to which reference has just been made. At the end of June there was one shaft down to a depth of approximately 100 ft. A number of others had reached a depth of only about half of this. Time did not permit of our sampling any of the orebodies, and moreover it is not the business of this Bureau to undertake sampling except in rare instances. It could be seen, however, in hand specimens that the quartz in several of the deposits is high grade. Moreover, the writer knows, that so far as systematic sampling has gone, the results are considered to be satisfactory. Of course experienced gold-mining men will not lay too much stress on surface assay values.

Transportation facilities up to the present have been poor, and it is surprising that as much progress has been made as is shown on some of the properties. The Timmins property is well equipped with plant and camp buildings. The plant consists of two boilers of 50 hp. capacity, a 6-drill compressor, hoist, and other equipment. A 2-stamp Tremaine mill is to be erected for sampling. The Dome mines have a somewhat similar plant to that of the Timmins. A Nissen stamp, now on the ground, is to be erected for sampling. Other properties with plants are the Bannerman and the Crown Charter. While conditions of travel from the railway to Porcupine during the spring were not good, it will be a not unpleasant trip during the summer. Good accommodations are available at the hotel and boarding houses at Porcupine lake. Transportation facilities are being increased. Before autumn the route from the railway will, it is believed, be much improved.

*Abstract from legend of a map prepared by Mr. Miller and published by the Department of Lands, Forests, and Mines of Ontario, August 16. The map itself is on the scale of one mile to the inch and is accompanied by two large scale-sheets showing the quartz veins on the Timmins, Dome, and Foster properties.

Standardization of English in Technical Literature

F. F. A. Read

*It should not be necessary to apologize for submitting the consideration of this subject. Whether my views prove acceptable or not is a small matter; my aim in addressing you is to engage your interest in matters not alien to the purpose for which this Institution was organized; to direct your attention to the intelligent use of words in technical writing. Whether you agree with my views on the subject is of no vital consequence if only, by arousing your critical faculty, you may be induced to use in a thoughtful way words and phrases that you now employ thoughtlessly, or, shall I say, habitually, without having taken the trouble to consider the fundamental principles involved. Let us agree to disagree, if you will, but let us unite in performing an important part of our professional work in a scientific manner, as becomes technical men.

"Science and literature are not two things, but two sides of one thing." So said Huxley, and he illustrated his own saying until his writings became as glimpses of the obvious and his lectures as windows into the infinite. We need to be reminded occasionally that science is not divorced from literature, and that even technology is not compelled to go about as if legally separated from good English.

As technical men we are always ready to lay stress on the necessity for precision, yet when we come to record the observations and conclusions gathered and formed during a laborious career we are apt to use the first verbal implements at hand, instead of chiseling our speech with the tools given to us by the masters of language. As well try to cut a statue out of marble with a dull adze as to express scientific ideas by aid of colloquial words, local terms, and vulgar idioms; as well paint a sunset with a scrubbing brush.

The purpose of language is to convey ideas; the intent of technical writing is to transfer accurate information, whether as fact or theory, from one man to another to the gain of all. Indeed, the benefit is usually more to the giver than to the receiver. In the exchange of ideas it is particularly true that it is more blessed to give than to receive. No man learns so much from the writing of a book or an article as the author himself. It has been well said that if you want to learn all about a subject, write a book on it. At the start the writer finds his knowledge as full of holes as a sieve and his thoughts as turbid as the pulp from a stamp-mill. In the effort to convey information by writing he crystallizes the amorphous ideas collected during years of study and observation; he submits the confused notions in his brain to the settling process of logical thinking, whereby the true is precipitated from the false, the accurate is decanted from the inaccurate, the fact is filtered from the supposition, and, finally, the solution of speech pellucid but crowded is outpoured generously.

The value of such a performance, either to the writer or to his readers, depends upon the manner of it. There be those that write on a subject only helplessly to obscure, only hopelessly to obfuscate, only stupidly to mislead. Even men possessing much verbal experience or exceptional knowledge may fail in conveying either the one or the other because they make careless use of the medium employed.

A notion used to prevail, and still survives, that nicety in the use of words is in a practical man almost effeminate. To some people the effort to write correctly is deemed an affectation, as if it were not as essential to the comprehension of the long-suffering reader as to the understanding of the author himself, whose ideas are clarified by using a correct medium of speech.

The turbid pulp in a mill is made clear by passing through classifiers and settlers. Not until a technical man sits down and begins honestly to tell what he knows on any given subject does he find how hazy is his information, and if he indulge in vague generalities, careless terms, and involved idioms, he never will render himself or his ideas clear either to himself or to his readers. Thus, an intelligent use of the medium of written speech is self-discipline, to which every serious worker ought to submit himself at regular intervals as a measure of efficiency and a stimulus to betterment.

Huxley said that Spencer's idea of tragedy was a theory killed by a fact; my idea of the tragic is the vast amount of useful information that is lost by being unrecorded. What enormous quantities of notes, the embryonic beginnings of scientific literature, remain undeveloped and are finally cast into the fire! It may be that some of them are better fitted to light the hearth than to fire the imagination, but at least I would have them sifted and sorted, if haply they may contain nuggets of information or gems of thought. Every year some mining engineer or metallurgist dies leaving a bulky collection of notes useless to anyone but himself, and useless at last even to himself; such notes may relate to unique observations or individual experience, the record of which would be as stepping-stones to those that follow.

In some cases the expectation has been to complete the study of a subject before rushing into print. As if anything were complete in this transitory world! Nothing is more pathetic than the expectation of saying the last word on a subject. It never will be said. The best we can do is to contribute our little all as a mite to the great legacy of knowledge, and then hope to merit an epitaph like John Richard Green's: "He died learning."

The amount of information at first-hand possessed by any man is pitiably small; we are all hopelessly in debt to others—to our contemporaries, to our forefathers, to the race. Yet each man possesses some little bit of knowledge, whether as observation, theory, or experience, that is his very own. Thus each can contribute something to the general fund; and seeing how much he owes it is asking but little that he give cheerfully what he can.

*Abstract of paper read before the Institution of Mining and Metallurgy, London, on May 26, 1910.

Of course, narrow minds still continue to fondle the mean belief that to give information gratuitously is to throw away a stock-in-trade, and that to keep secret the professional or technical experience of a life is to possess an added weapon in the arena of industry. But this is a pitiable fallacy, scarcely worthy of castigation. If adopted universally we would be today as the Hottentot or the Eskimo. Civilization has been evolved by the free exchange of thought and the frank transmission of experience. Whether we be advocates of free trade, fair trade, or reciprocity in matters of national industry, let us at least reject the shriveling policy of protection as applied to the world-wide traffic in ideas.

Science is organized common sense; technology is the precise expression of special knowledge. The ordinary information of an average man is like a pile of firewood, disorderly and bulky; the fund of useful information possessed by the technical man is like an orderly arrangement of fuel in definite lengths, arranged so as to be easily measured and readily available. The result is due to intelligent effort; it is not accident.

"The development of the mind is an advance from the indefinite to the definite." The technical man in his processes, whether of the mill and smelter or in the reducing operations of his mind, follows a similar line of progress. His constant effort is to distinguish between what he knows and what he thinks he knows, between fact and fancy, between observation at first-hand and information at second-hand. And when he comes to place himself on record he should follow an identical course, but with a difference. In his technical operations he deals in the main with insentient matter; in his technical writing he must keep in mind the human element, for he is writing not on stones to be placed in a desert, but on paper to be read by his fellows.

To be effective, sympathy is needed as well as knowledge, otherwise the effort will be sterile. Spencer, who studied style as an adjunct to philosophy, has said: "The good instructor is one in whom nature or discipline has produced what we may call intellectual sympathy—such an insight into another's mental state as is needed rightly to adjust the sequence of ideas to be communicated." In other words, **remember the reader!**

Every writer may not care to pose as an instructor, but in effect every serious writer does instruct to useful purpose, according as he renders himself receptive to the reader, by employing words in a convincing and agreeable manner. "Those are the most effective modes of expression which absorb the smallest amount of the recipient's attention in interpreting the symbols of thought, leaving the greatest amount for the thought itself." So Spencer said. This is the first principle of writing: economy of mental effort. Put yourself in the reader's place. If you do, sincerely and honestly, you will succeed in avoiding all the grosser errors of style and expression that prevent language from becoming pictorial, that hinder the transfer of ideas, and retard the transport of thought.

In technology, as in science generally, the tendency exists to employ impressive words as the symbols of vague ideas instead of using plain speech to express definite notions. Thus we have that comfortable word 'metamorphism' and that weak word 'dynamic.' In economic geology, the phrase 'secondary enrichment' is often used when the phenomena may indicate primary impoverishment. We use the word 'phenomenon' itself as if it stood for something definite. It means an unexplained 'appearance.' When we do not know what a thing is, we call it a 'phenomenon.'

Macaulay said: "I have often observed that a fine Greek compound is an excellent substitute for a reason." We use sonorous multisyllables like 'the chunk of old red standstone' that was thrown by one of the disputants in the row that disrupted the society upon the Stanislaus, as related by Bret Harte.

Apart from the failure to convey information, the use of impressive terms often entails a failure on the part of the writer to understand himself. It is easier to refer to a 'phenomenon' than to explain it, to impute to 'metamorphism' the thermal and physical changes that are seen as through a glass darkly, and to debit 'secondary enrichment' with vagaries in ore distribution that elude the comprehension of the mining engineer. Here again self-discipline should precede the attempt to teach.

Permit me to quote Samuel Johnson: "To explain requires the use of terms less abstruse than that which is to be explained, and such terms cannot always be found. For as nothing can be proved but by supposing something intuitively known, and evident without proof, so nothing can be defined but by the use of words too plain to admit of definition." Lest this sententious dictum should intimidate you, I quote another saying of the great lexicographer: "There is for every thought a certain nice adaptation of words which none other could equal, and which, when a man has been so fortunate as to hit, he has attained in that particular case the perfection of language."

While objecting to the reckless use of local terms and mere vulgarisms, I hope to escape the charge of pedantry. Of course, it is possible to cramp the use of language by too much self-consciousness, by the priggishness of a pedagogue or the pettiness of a pedant. My objection is not to the thoughtful use occasionally of local terms, or even slang, if thereby the meaning of the writer is made clearer, but to the thoughtless and unintelligent adoption of corrupt forms of speech. I do not object to the use of an unscholarly word or an unfamiliar idiom, if either of these is adopted deliberately in order to express ideas not to be appreciated when clothed in conventional terms; but I do protest against blunders arising from mere lack of care and to wilful ignorance of the simplest rules regulating the effective employment of language as a vehicle of thought.

You will remember Macaulay's pleasant correspondence with Napier, the editor of the *Edinburgh Review*. Napier had objected to the use of phrases that were flippant and words that were colloquial. Macaulay vindicated himself by referring to the practice of Addison, "the model of pure and graceful writing," arguing that a little levity of style was

occasionally descend at as a relief from continued earnestness and dignity. He went on to say: "The first rule of all writing—that rule to which every other is subordinate—is that the words used by the writer shall be such as most fully and precisely convey his meaning to the great body of his readers. All considerations about the purity and dignity of style ought to bend to this consideration." And it is safe to say that Macaulay himself did not find it necessary to sacrifice the extraordinarily high level of his style to the attainment of expression or to lucidity of thought.

If those who use the wretched vulgarisms and careless colloquialisms that disfigure so much of technical literature can find in Macaulay's plea for flexibility any warrant for their sins, they are welcome to the solace, but I fail to see any likeness between the intentional levity or reasoned laxity of a careful writer and the unintentional blunders or thoughtless errors of a careless scribbler.

We do not need to become as self-conscious as the centipede, of whom it is related, that he managed to get on well enough until one day he became aware of his hundred feet, so that he tripped and fell by the wayside in a hopeless tangle. Nor, in transferring thought from ourselves to others by means of the vehicle of language, need we imitate the reckless driver who blunders into all the ruts, over all the stones, into all the puddles, and ends by taking the wrong turning, so that his load of fodder never reaches its intended destination, but is scattered in a disorderly mess over the roads of half a county.

The language used in technical writing may be likened to the food we eat. One man says that he wants plain cooking; he does not care for highly-seasoned dishes, and rich entrées disgust him. Another has a delicate palate; he objects to mere chunks of meat and plain boiled vegetables; he asks for something daintier and more appetizing. As a matter of fact, so-called plain food easily degenerates into what the American calls 'hash'; it may be so tasteless and sodden as to be palatable only to a hungry man, while on the other hand the rich sauce and delicate *garniture* soon pall to the satiety of *toujours perdrix*.

In writing as in cooking, in the intellectual as in the physical nourishment, it is necessary to avoid extremes and keep in mind the purpose of the performance. The ideal is good food well cooked and judiciously seasoned, neither so crude as to be unpalatable nor so elaborate as to cloy the taste.

Further, in literature as in gastronomy, the purveyor of nourishment will recognize the necessity for adapting his products to the taste of those whom he desires to please or to strengthen, varying his viands accordingly. Writers who start with the idea of naturalness and simplicity of literary manner are apt to deprecate the tricky allurements of the stylist until they themselves write uncouthly, and may take such pains not to be florid as to become merely bucolic. Their counterpart is the writer who obtains so much enjoyment when weaving words as to forget the object in view, and is so particular as to the manner as to overlook the matter. Both errors of extreme can be cured by paying attention to the fundamental rule—**Remember the reader!** When you cook, remember who is to eat the meat. A [illegible] would disgust a bricklayer, but a plate of pork and beans might nauseate a bishop.

So, gentlemen, I have felt warranted in trespassing upon your courtesy. I deem myself justified in calling your attention to a subject that seems at first sight only academic, but is in truth as practical as any other appertaining to the work of the engineer. Next to doing things is the ability to state clearly how they are done; next to the possession of useful knowledge is the power to impart it to others.

Men are known by their deeds, but more men are known by their writings; the deed is forgotten, the writing remains. We judge the men we have not met by the letters, reports, and other writings emanating from them. There is an acquaintance wider than that of personal contact, and more intellectual than that of the dinner table.

To a young engineer the ability to write tersely and clearly is an accomplishment that makes him favorably known to those in authority. Many a youngster has obtained the chance of promotion because he compiled his routine reports so that they were instinct with intelligence instead of being dead bundles of words. This is only reasonable, for a crisp and clear manner of writing can come only from vigor and lucidity of thought, such as indicate the efficiency for which the engineer continually strives.

Until you meet a man you judge him by his letters; until you have seen the work of a technical man you judge him by his reports. Therefore, I urge the younger supporters of the Institution, particularly the students, to give heed to this function of the engineer. The older members may be past hope, for the proverb says that you cannot teach new tricks to an old dog, and in any case I do not expect my contemporaries to accept my views as authoritative. But to the younger men I can appeal with the enthusiasm of reform and with the conviction of experience, beseeching them to give heed to a matter the practical importance of which is undeniable, and the neglect of which is a serious blemish upon a profession that should combine the precision of the technologist with the liberality of the scholar.

Dikes and sills of mica-peridotite and pyroxene-lamprophyre occurs in western Kentucky and southern Illinois, and have been recently described by F. J. Fohs. Mica-peridotite occurs on both sides of the Ohio river, while the pyroxene-lamprophyre has been found in Illinois only. The former is characterized by olivene, the latter by a colorless augite. The mica common to both is largely phlogopite and occurs in phenocrysts or laths in a dark green compact ground-mass. The rocks run 34% silica, which indicates their extreme basicity. Little or no feldspar occurs in them; apatite, magnetite, ilmenite, and perofskite are among the accessory minerals. The rock, for the most part, is found greatly altered. It weathers to a soft green and finally to a golden-yellow micaceous clay. Serpentine, calcite, pyrite, and other minerals are among the alteration products. The dikes, with one or two exceptions, strike northwest.

Gold Mining in Korea, 1910

By J. D. Hubbard

A matter of twenty years ago, it became possible for Americans to obtain concessions and exploit the gold deposits of Korea. At present American mining concessions have assumed large proportions, and the total amount of bullion produced per year from quartz and placer properties amounts to over four million dollars. Korea, although about the same size as California, has a wide mineral belt and almost untouched natural resources. The old system of 'squeeze' practised by officials on the poor native, precluded any ambition for riches, as the latter brought only torture and imprisonment until the coin was given up. Consequently the 'Hermit Kingdom,' with the exception of a few worked-out placers, presents an exceptional field for exploitation by experienced mining men. It is a poor place for speculators.

In the early nineties C. W. Morse obtained the whole province of Unsan, in northern Korea, as a mining concession, with full power to develop all mineral in it, and with almost sovereign rights over the native population. This concession was obtained from the Emperor of Korea through Mr. Allen, the United States Minister. Mr. Morse soon sold out to Leigh Hunt who financed the great Oriental Consolidated Mining Co. in an able way. The capital was placed at five millions, which was a bold thing to do then, but time has proved this amount to be conservative. Mr. Hunt partly developed the concession and then sold out the majority of his holdings, having cut, as some thought, the heads off the asparagus. Events have proved that the root and stalk were full of vitality and many new heads have grown since. The Oriental Consolidated is unquestionably the greatest mining company in the whole Orient, including Japan, Siberia, Manchuria, China, and India, with the possible exception of the Mysore mines at Kolar. The company has 240 stamps dropping on ore at the present date, distributed as follows: Tabowie 80, Taracol 80, Kuk San Dong 40, Maibong 30, Candlestick 10. For the fiscal year ended July 1, 1909, there were crushed 296,417 tons of ore, the average value per ton being $5.79 and the total assay value $1,716,104. The bullion produced was $1,438,342. The ore reserves at that time were estimated as follows:

Mine.	Tons.	Value.
Tabowie	339,182	$1,591,041
Taracol	175,000	875,000
Chintui	58,000	232,000
Kuk San Dong	132,000	372,225
Charalowie	29,100	165,200
East Candlestick	600	8,400
Total	733,882	$3,243,866

The total operating cost for the year was $798,424 and the total operating profit $639,918. The amount put back into new construction and development was $83,548, leaving the net receipt for the year over all expenditures $556,370. The report for the fiscal year ended July 1, 1910, is not yet out, but the figures are all a little higher than the preceding year even, while the ore reserves have largely increased.

The O. C. M. Co. boasts five mines that have produced over one million dollars each, and soon Chintui will rank as sixth. The company supports a population of at least 50,000 people, and has made the province of Unsan the most prosperous of any in Korea, and the markets are second only to those of Seoul, the capital. The company hospital at Taracol has had the largest attendance for the past two years of any in Korea. This is due to the generous policy of making no charge for services or medicine, and due no less to the excellent system and results obtained by J. W. Nolan, the physician in charge. For the fiscal year ended July 1, 1909, there were 15,652 cases treated, 7878 of that number being company employees. The total cost was $6706.71. The past year over 16,000 cases were treated and medicine furnished for 20,000 people at a total cost of $7500. It is impossible to measure the great boon the Taracol hospital confers on the Korean, whose own medical practice, if it could be called such, is abominable. The Koreans themselves say that where four people died before, but one dies now.

At Taracol are also the company's main machine, blacksmith, and carpenter shops, the foundry, and planing mill, all equipped with good modern machinery. W. H. Aldridge is master mechanic in charge, and in such an odd corner of the world, his ingenuity is often taxed severely by the many demands made upon the shops. This ranges from putting new wicks in lamps and repairing baby carriages, repairing automobile boilers, etc., to building mine pumps and hoists. The big cyanide plant is also at Taracol, and this is the headquarters of the metallurgical department. For the past three years over 84% actual extraction has been obtained by direct leaching of the concentrate in cyanide solution. The company is now preparing to install a modern plant in order to obtain an even better extraction. A. E. Drucker has been appointed as special consulting metallurgist to plan and put in operation this new plant; an excellent appointment. In the matter of the past extractions at the O. C. M. Co.'s plants, an opinion seems to obtain among mining men that they have been low, the methods ancient; but over 84% actual extraction is probably rarer than many suppose. There are at least a few mining companies of which I know, and which are supposed to be up to date, whose actual extractions are below 75%. Even in Korea, it will be hard to make the old dumps pay a profit with a modern plant. Fresh concentrate from a new mill will be different.

The company has a very good system of prospecting, which has been generally adopted by the other mining companies in Korea. Natives are given leases and encouraged to bring in tribute ore to the mills. They are paid 40% of the assay value and in case of low-grade ores only a nominal milling charge is made, that the Korean tributer may not be discouraged. When a good vein is found it is taken over by the company at the expiration of the tributer's lease, and a proper plant installed. The latest prospect taken over by the O. C. M. Co. is at Char-

rongo 17 miles from Fusan. This is a fine prospect and will probably develop into another good mine. The vein is 15 ft. wide on the surface, assays $3, and has an excellent surface showing for over 2000 feet.

The O. C. M. Co. has had its troubles like all big companies. About two years ago cordwood and mine timbers became scarce as the visible supply on the concession was about exhausted. The nearest supply was six miles from the big camps, Taracol and Tabowie. H. F. Meserve, at that time general manager, made an agreement with the Japanese Forestry Service, whereby upon payment of an annual tax of $12,500 the company could cut all the wood and timbers necessary for the mines from the forests in Chosan province. To make this timber available a railroad, eleven miles long, was constructed at a cost of $50,000 to haul the wood and timbers to a point convenient to the mines. The investment has proved a good one. The company allows natives to ride free on the trains and even transports free of charge their personal belongings. J. N. Fletcher is the general freight, traffic, and passenger agent of this unique railroad. The O. C. M. Co. has a long life ahead of it, and is easily one of the world's greatest gold mines. Alf. Welhaven is now general manager in Korea.

Pakadong Railroad

Tunnel on Pakadong Railroad.

The second American gold mine of importance in Korea is the Seoul Mining Co., at Suon, in Hwang Hai province. The concession covers an area of ground 20 by 13 miles, and the company has exclusive mineral rights to examine, develop, and operate all mines and deposits for a period of 35 years from 1905. The regular royalty of one per cent on the gross output is paid to the Government. Collbran & Bostwick were the original owners of this concession, and still retain a large interest in the corporation, together with W. D. Townsend, of Chemulpo, Korea; S. L. Selden, of New York City; M. P. Sayce and F. B. Lawson, of London. A. H. Collbran is general manager in Korea. The company is capitalized at $500,000 or 5000 shares at $100 each. A 20-stamp mill was started last November and 20 more have been added and are now in operation. Each stamp has a duty of four tons in 24 hours. The ore averages $18 per ton in gold and copper, the copper being estimated at 12c. per pound. The ore is crushed and amalgamated, goes over plates to James tables, thence to a Richards pulsator classifier, the coarse product to a tube-mill, and all fine and slime over plates again and to James slime tables. The screens on the batteries are 20-mesh. The sulphides contain about 28% copper, in bornite and chalcopyrite; also some bismuth, galena, and pyrite. Below the mill is a canvas plant with two tables 50 ft. long and 14 wide, with a strip down the centre to facili-

Taracol Head-Frame.

Miners at Taracol Mine.

tate sweeping. One side is swept at a time with hose and flat nozzle under good water-pressure. The canvas is laid horizontally and laps slightly. The main vein at Suon is 40 ft. wide, the pay-streak averaging 8 ft. It is all developed through adits. About ten Americans and 600 Koreans are employed. The concentrate is shipped to the Pacific coast for treatment. Suon is exceptionally well situated as to shipping facilities as the mines are only eight miles from a branch of the Pyeng Yang river, and water transportation is available from there. Mr. Collbran, the general manager, estimated the ore reserves on December 31, 1909, as 172,450 tons of ore at $18.38 per ton. The company is in a healthy financial condition and will surely grow.

The Korean Exploration company at Chiksan, in South Chenn-do province, has been developing its mines, and in the past year its four Nissen stamps put through 7000 tons of ore. The net return per ton was $13.60, with concentrate still to be shipped. The ore contains one per cent concentrate worth $200 per ton. The company is now putting in three 1-stamp, Hendy, quadruple discharge batteries, and two more Standard concentrators. Three feet of the vein carries ounce ore, and the placer properties of the company are good. The stock of the company is owned half by Americans, and half by Japanese capitalists. One-fourth of the net proceeds goes to the Government. Most of the stock is held by a few men. The mine was badly managed for a time, but is now well on the way to become one of the really good gold mines of Korea. Albert Taylor is the present general manager, and W. S. Farnham is superintendent. Eight Americans and about 320 natives are employed.

At Sackju, twenty miles from Wiju, in northern Korea, the Western Engineering Co., controlled by Hoover & Bates, have a concession. W. S. Holloway is manager. This company paid 90,000 yen for the concession. It contains no large lode but many small quartz veins in gneiss, and some good placer ground. The ore contains about one ounce of gold per ton. The company leases these small veins to Korean tributers who pay one-third royalty. About 2000 Korean wooden stamps are now crushing 300 tons of ore per day, and saving about 75% of the gold. The Korean miner gets one-third, the mill one-third, and the company one-third, and all are doing well. A modern custom mill would be a good paying investment and would develop the country. The company should install one without delay. There is plenty of water for battery use but not enough for power. From late advices the company is preparing to erect a 20-stamp unit of a new mill. It is reported that they have enough ore in sight to run these stamps for ten years. Many of the veins in the gneiss are of sufficient width for good stoping. Some Japanese are cyaniding the tailing from the Korean stamp-mills, in Salei tubs, and making a profit. This property is only seven miles from the Yalu river.

Numerous smaller prospects are held by Japanese and Americans with a large extent of still unprospected country. Some individual Japanese are taking out gold from placer workings, while several Americans are developing quartz prospects. Morris & McGary, of Seoul, have some excellent prospects in several provinces, some of which bid fair to become good mines. In the next decade many fortunes will be made by the persevering and those who know the game. The Japanese welcome mining exploitation and are friendly and courteous to Americans in Korea.

THE DETERMINATION OF COPPER IN COPPER-BISMUTH ORES

By C. C. O'Loughlin

The following method for assaying ores for copper that carry from 0.5 to 3% of bismuth, is used at the Bogardus Testing Laboratories, at Seattle. It may be of interest to others since no data on methods suited to these conditions are generally available.

At first the bismuth was precipitated with ammonium carbonate, making two separations, but this was not found satisfactory, as the separation was not complete. The filtrates were run electrolytically, but deposits were found to turn into a dark sponge, and drop off, even with different current density, because of bismuth still being retained in small amounts. The iodide method with the above separation, was found to give low and erratic results. It was then thought possible to precipitate the bismuth as the sub-nitrate, plating the copper direct in the filtrate; but the separation was not found suitable. The following method was finally adopted and found to be highly satisfactory.

Treat 0.5 to 1 gram of pulp with 8 c.c. HNO_3, digest at low heat until fumes cease, add 2 c.c. H_2SO_4, and evaporate to SO_3 fumes. When cool, wash down cover and sides of beaker, first add ammonia, and then acidify with HCl, adding a very slight excess. Keep the volume as low as possible. Have a 500-c.c. beaker ready, containing about 250 c.c. hot water, and a little ammonium chloride. Pour assay into this slowly with constant stirring and allow to settle one-half hour. Filter off the insoluble and the bismuth, which has been precipitated as the oxichloride, wash well, add 2 c.c. H_2SO_4 to the filtrate, and precipitate the copper with sodium hyposulphite. Filter, wash, burn precipitate, brush into a copper beaker, and dissolve with 5 c.c. HNO_3, heat until dissolved, dilute with water, add 3 c.c. H_2SO_4, and plate $N.D._{100}$ 0.10 amperes.

If preferred, the copper can be titrated with sodium hyposulphite by taking the solution nearly to dryness. After dissolving the copper precipitate in HNO_3 neutralize with sodium carbonate, acidify with acetic acid, and titrate. Bismuth can be run in the residue from first filtration by dissolving away from the silica and precipitation as oxichloride, burning and weighing as oxide.

Copper mining in Alaska, according to Bulletin 442, of the U. S. Geological Survey, was less active in 1909, when seven properties were productive, as compared with nine properties in 1908. The output for 1909 was valued at $536,211; that for 1908 at $605,267.

Design of a Mine Plant

By J. W. Worcester and W. P. Cass

Part II—Hoisting

***Load and Speed** The hoist is to have a capacity of 225 tons in 12 hours, to operate in a two-compartment shaft (see Fig. 1 and 3). The compartments are 980 ft. deep and vertical with a section of 4 ft. by 4 ft. 6 in. in the clear with the exception of 4 in. guides. The cages are to be light-weight steel, weighing, approximately, 1000 lb. The cars are to be of the type known as 'Leadville,' holding 14 to 15 cu. ft., or 2500 lb. ore, and weighing approximately 650 lb. each.

If 225 tons be hoisted through one compartment in 12 hours, there will be required 4 minutes for a round trip; if hoisted in two compartments there will be available 8 minutes per round trip for each cage. For purposes of calculation all ore is considered as hoisted from a depth of 1000 ft. It is assumed that 20 seconds are necessary for acceleration and slowing at the beginning and end of the trip. The weight would be: weight of cage, 1000 lb.; car, 650; ore, 2500; ¾-in. rope, 880; weight due to friction, 415; total, 5445 lb. This total weight is the rope-pull in unbalanced hoisting. Friction is 10% of the weight of cage, car, and ore, due to friction of rope over the sheave and of cage on the guides. The maximum speed of hoisting is to be 800 ft. per minute.

Acceleration may be estimated as follows: $S = \frac{Vt}{2}$ $14 \cdot \frac{20}{2} = 140$ ft. for acceleration at both top and bottom of shaft. Where S = distance in feet in which to accelerate; V = final velocity of acceleration in feet per second; t = time of acceleration in seconds; $1000 - (2 \times 140) = 720$ ft. or the distance in which a speed of 800 ft. per minute is maintained. The time therefore during which a constant speed of 800 ft. per minute is maintained is 0.9 minutes; acceleration at start, 20 seconds; at end, 20; running at constant speed, 54. The total time that will be necessary to start cage from rest, raise it 1000 ft. and bring to rest again, will therefore be 94 seconds, and the total time necessary for a round trip is 3 min. 8 sec. Then, 8 min. − 3.12 min. = 4.88 min. or more than one-half of the total time for caging at both ends, lowering men, timbers, and supplies.

When hoisting unbalanced, the figures would be: force required to accelerate cages, cars, and ropes, 119 lb.; therefore 5445 + 119 = 5564 lb. maximum rope-pull during period of acceleration; $\frac{5570 \cdot 800}{33{,}000 \times 0.8}$ 159 hp. maximum required as in-put to hoist motor; $\frac{5445 \times 800}{33{,}000 \cdot 0.8} = 155$ hp. normal requires, when running at 800 ft. per minute, as in-put to motor, 80% being assumed as mechanical efficiency of hoist.

When hoisting in balance: weight of cages, 2000 lb.; ore, 2500; rope, 880; cars, 1300; friction on sheaves and guides due to weight of cages, cars, and ore, 480 lb. weight to be used in calculating accelerating force when hoisting in balance, 7340 lb. F $\frac{\text{Tdp}}{2.2}$ $= 151.5$ lb. Weight of ore 2500 lb., rope 880, friction 415, total 3795 lb. $3795 \div 151.5 = 3946.5$ lb. maximum rope pull during period of acceleration. $\frac{396.5 \cdot 800}{33{,}000 \cdot 0.8} = 114.5$ hp. maximum required as in-put to hoist motor $\frac{379.5 \cdot 800}{33{,}000 \cdot 0.8} = 108.5$ hp., normal required, when running at 800 ft. per minute, as in-put to motor.

The rope pull, when up to speed, is 5445 lb., but in the calculations for acceleration the extra pull was found to be only 119 lb. for the 5000-lb. rope-pull. Evidently in practice this factor would be much greater, probably as high as 1500 lb. or more. Assuming this as 1500, the maximum power would be increased from 155 to 198 hp. for unbalanced hoisting, and from 108.5 to 150 hp. for balanced hoisting. This discrepancy is due to the fact that in calculations only the masses of the two cages, cars, ropes, and ore are considered to be accelerated; while to this amount should be added the masses of the sheaves, drums, gears, and motor armature; also there should be taken into consideration the friction of the sheaves and shafts, and internal frictions of the hoist and motor.

Perhaps as good a method as any would be to compare the kilowatt in-put curves, taken from plants where direct-current electric hoisting with Ward-Leonard control is used, and from the analogy with these curves, draw a curve accordingly for this particular installation. Fig. 4 shows this. The full line

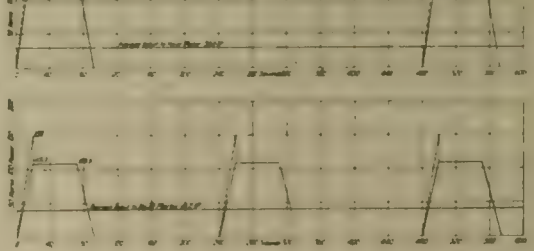


Fig. 4.

indicates the horse-power in-put to the hoist-motor according to calculations, and then, by comparison assuming the value of F to be about 1500 lb., the peak load is shown in the dotted line. This maximum peak load, however, is only momentary and has not been considered in selecting the hoist motor, for the motor could stand this large overload for the short period that it would be required.

The hoist selected is equipped with a 200-hp. motor; double drum, size No. 8; each drum is 66 in. diam. by 30 in. between flanges. For foundation plan see Fig. 3. This hoist is provided with post brakes and band clutches. Inasmuch as the hoist-motor is called upon for its maximum load (159 hp.) during only a short interval, and the time intervals

**Mining and Scientific Press* prize thesis, presented as part fulfilment of the requirements for graduation at the Colorado School of Mines, June 1910. Continued from p. 205.

are spaced at least 3 min. 8 sec. apart, a 200-hp. motor is unnecessary. A 125-hp. slow-speed D. C. motor (6-pole, 230 volts, 550 r.p.m.) is therefore selected. This motor is capable of carrying a 28% overload for 15 minutes and can deliver 160 hp. during the short time required.

Shaft-House and Head-Frame.—The shaft-house is to be a 32 ft. by 25 ft. 6 in. frame structure, with frame work of 8 by 8-in. timbers, covered with 1 by 12-in. boards; equipped with shingle roof sloping

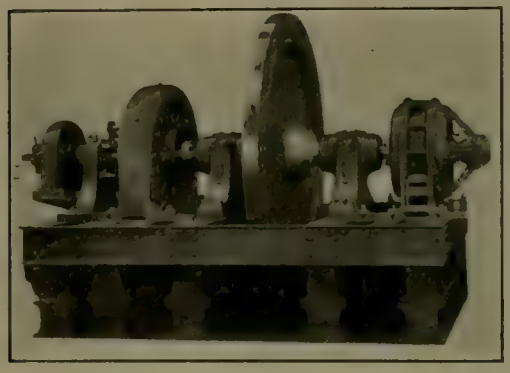


Fig. 5. Motor Generator With Flywheel.

45°. Windows are to be placed only at the ends of house. (See Fig. 1 and 3 for elevation and plan of shaft-house.) The head-frame is to be of 12 by 12-in. timbers throughout and 50 ft. from floor of shaft-house to centre of sheave, the braces to be placed at an angle of 60° with the horizontal, all timbers to be securely tied with 1-in. steel rods. The posts and braces of the head-frame are to be set in cement piers properly embedded in the ground.

Transforming.—The main current, as supplied by the power company at 6600 volts (3-phase, 60 cycles), is to be transformed to 440 volts in the transformer-house, at the surface plant, before entering the power-house. The horse-power required by the several departments, as in-put to the switchboard, is as follows:

	Hp.	Kw.
Motor-generator set	75.0	56.0
Pumping	36.8	27.0
Compressing	285.0	212.4
Lighting	17.6	13.1
Shops	12.5	9.3
Total		318.2

For transforming this three transformers have been selected, type H, 125-kw. delta connected, to be placed at one end of the transformer-house, two smaller transformers to step the 440-volt current down to 110 volts, for surface lighting and shop motors, will be placed in the same house. The other equipment of the transformer station will consist of knife switches, oil switches, and lightning arresters. This equipment is furnished and set up by the company selling power. The transformer-house is to be built of corrugated iron.

Power-House.—For dimensions of the power-house and location of the various units, see Fig. 3. On account of the heavy wind stresses and snow loads, which are often simultaneous in this locality, a heavy roof-truss has been selected. It is to be supported on 12-in. steel columns, built in the brick side-walls of the building.

Motor-Generator Set.—With electrically-operated mine plants in general, and more especially small plants, where hoisting is the major load-factor, it is desirable to have as high a station load-factor as possible. This is important economically in two ways: first, when the power is generated by an isolated plant at or near the mine, the more uniform the demand for power, the smaller may be the rated capacity of the generating station, and the greater the freedom from undesirable fluctuations of voltages in the system in general. In the second place, when power is purchased, where the charge is based on the maximum peak-loads, the saving is material with a small increase in the load-factor, which tends to equalize the demand on the mains. The latter case applies to this problem, and with this in view a motor-generator set with fly-wheel accumulator, according to the Ilgner system, with the Ward-Leonard control for the hoist-motor has been selected. (See Fig. 5.) This set consists of an A. C. rotor-wound, variable-speed induction motor, direct connected to a D. C. generator with a fly-wheel on the same shaft as the armatures of the motor and generator, and between the two. The generator supplies current for the direct-current shunt-wound hoist-motor. The fields of both the generator and the hoist-motor are excited by a small 250-volt ex-

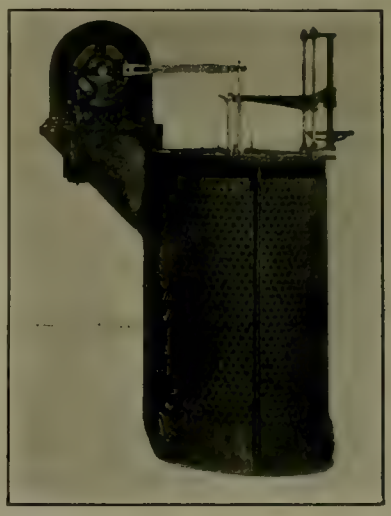


Fig. 6. Automatic Slip Regulator.

citer on the same shaft. A Terrill automatic regulator keeps the voltage constant, regardless of the variations in speed of the set.

The speed regulation of a D. C. motor has many advantages both as to economy and convenience over that of an A. C. motor. In this system the control is as follows: the controlling resistance is placed in series with the generator field, by varying this field excitation the output of the generator is varied and therefore the speed and direction of rotation of the hoist-motor is controlled. The only resistance, and consequently the only loss brought in, is that in the field excitation of the generator, and this is small

compared with that represented in the contract A. C. variable speed motor. This is an important advantage over ordinary A. C. hoisting systems. The A. C. motor is supplied by 3-phase, 440 volt [illegible] current from the mine transformers. Its speed is controlled by an automatic slip regulator, Fig. 6, which cuts resistance into or out of the armature circuit as the load on the generator increases or decreases. Increasing the resistance in the armature increases the slip, and this allows the fly-wheel to give up its energy and vice versa, the fly-wheel stores up energy as the load drops off, thus allowing the motor to expend part of its energy in accelerating the fly-wheel. By this means the extreme variations of the hoist-motor are transformed into practically

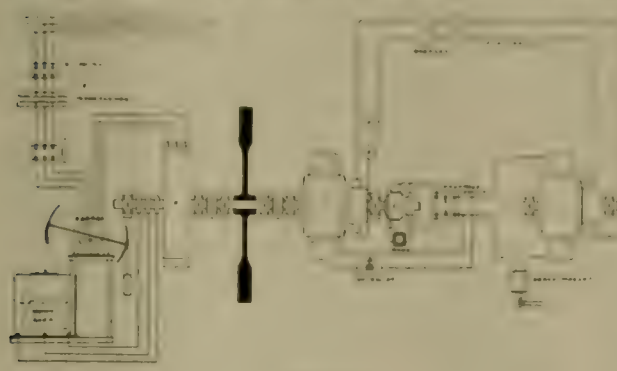


Fig. 8.

a constant demand from the A. C. mains and the loss due to the resistance introduced, at times, in the rotor is negligible.

Hoist-Motor.—It is seen from the above that a slow-speed D. C., 125-hp. 'DLC' General Electric motor has been selected to run on 230 volts at 550 r.p.m. and capable of delivering 160 hp. for 15 min. This gives an overload of only 28%. This motor is shunt-wound and connected to the hoist by a double reduction in gearing. The gears are to be steel and machine cut. The drum of the hoist is 66 in. diam. and revolves at 46.2 revolutions per minute.

Direct Current Generator.—A 100-kw. 6-pole, 250-volt, 675 r.p.m. (variations 547.2 to 684 r.p.m. allowable) specially constructed direct-current generator has been selected. This generator has to be especially constructed to be able to withstand the variations in speed and still deliver full load.

Alternating Current Motor.—This motor will be required to operate under a 20% slip below full-load speed. This slip has been used because any motor similar to the following will operate under 25% slip with only a slight decrease in efficiency. With larger motors the slip cannot be so great, and for faster hoisting the slip must be less.

Fig. 4 shows a curve plotted from horse-powers and time of hoisting of both balanced and unbalanced hoisting. It is found that for balanced hoisting the average in-put to the hoist motor is 41 hp. or 30.75 kw., and for unbalanced hoisting 30 hp. or 22.5 kw. These curves are integrated for a cycle and divided by the periods, this giving the average in-put to hoist-motor. Assuming the average efficiency of generator, motor, and fly-wheel to be 55%, which is approximately that used in general practice and allows for efficiency of motor and generator and friction of shaft on bearings the in-put to the A. C. motor must be for the worst case balanced at least 75 hp. A type 'M' General Electric 60-cycle, 3-phase, 440 volt, 10-pole, 720 r.p.m., 75-hp. slip-ring alternating current induction motor has therefore been chosen. The full load speed of this motor is 684 r.p.m. and with 20% slip unbalanced it will be 547 r.p.m. These are the limits between which the fly-wheel must give up the required amount of energy. The torque produced by the full load value of the main line current in the rotor is balanced in the installation, as outlined, by the weight of the moving parts of a water rheostat, which is used in connection with the slip regulator, in case water cannot be had for such purposes a block resistance can be used.

Fly-Wheel.—The fly-wheel has to deliver the difference in power between the maximum required by the hoist-motor and that delivered by the A. C. motor to the hoist-motor. A solid cast steel fly-wheel, 10 ft. diam., and slightly hollowed between the rim and the hub has been assumed. The proportions are such that the centre of gyration is at a point approximately 0.78 of the total radius from the centre of rotation. The maximum horse-power required by the hoist-motor is 159; the minimum delivered by A. C. motor, 30; the maximum required of the fly-wheel, 129. The kinetic energy of the fly-wheel, or any rotating body, is equal to the product of the weight of the body by the square of the linear velocity of the centre of gyration divided by twice the acceleration due to gravity. Then $E = \frac{WV^2}{2g}$. When reckoning the kinetic energy between two velocities V and V_1, this formula becomes $E = \frac{W}{2g}(V^2 - V_1^2)$ where V = maximum linear velocity of the centre of gyration in feet per second, when wheel is working 684 r.p.m. V_1 = minimum linear velocity of the centre of gyration in feet per second when wheel is working 547.2 r.p.m. Radius of gyration = 0.78r = 0.78 × 5 = 3.9 ft. when r = radius of fly-wheel in feet. V = 27.9 ft. per second. V_1 = 22.7 ft. per second. The maximum velocity of the rim = 21,500 ft. per minute, therefore a cast-steel fly-wheel can be used. Total time for hoisting cage with load, 94 sec.; total time for retarding cage with load, 20 sec.; period during which fly-wheel gives up 129 hp., 74 sec. In order to furnish the necessary horse-power (129) during the required time interval the weight of the fly-wheel is calculated as follows:

$$\frac{W}{2g}(V^2 - V_1^2) = 129 \times 550 \times t$$

Where t = the time in seconds during which 129 hp. is required of the fly-wheel. Transforming and substituting $W = \frac{2 \cdot 32.2}{(27.9)^2 - (22.7)^2} 129 \cdot 550 \cdot 74 = 12{,}910$ lb. —call this 13,000 lb. Therefore, a fly-wheel weighing 13,000 lb. is selected. For balanced hoisting this weight of wheel will call for a slip of the A. C. motor of 6.29%. From the rates guaranteed by the com-

pany from which power would be purchased, hoisting without the motor generator set will cost $80.50, and with it $37.95 per horse-power year. This gives a saving per horse-power year of $42.65, and merely shows that, even with a small plant, there is a saving in cost of hoisting of 52.9%. See Fig. 8 for the diagram of wiring of motor generator set.

Conclusion.—This method of hoisting was selected because of its advantages over the common system in safety, better control, and economy of operation. As regards safety, it is generally known that in electrical hoisting there is an element of danger, due to the fact that the power is apt to be shut off at any moment. With this system there is enough energy stored up in the fly-wheel to enable the operator to at least lift the men out of danger, and in all probability would be sufficient to hoist them all to the surface. This is especially important when sinking, for the men are then in a dangerous position and must be certain of being carried out of danger. That the plan adopted affords the necessary security is indicated by the fact that at the Kendall mine, Kendall, Montana, where a similar installation is in use, two trips with the cages loaded and five trips when empty can be made with no power in-put to the A. C. motor. Similar examples might be cited in German practice. The operator can work more quickly and with greater certainty with the Ward-Leonard control than with any other, and this is a decided advantage when compared with A. C. hoisting. The system has further the advantage of electrically breaking the load in such a way that the operator has complete control over the moving parts, and a retardation of the same returns and appreciable amount of energy to the fly-wheel. There is no excessive wear on the hand breaks, for these are only used to hold the load. The hoist can also be equipped with apparatus that at the proper moment automatically reduces the speed, and prevents overwinding. The electrical units, while expensive, are not so much so but that the saving in cost of operation will pay for them in a short time. This system has here been applied to a small mine, and the calculated saving in operating costs is gratifying. In mines where large tonnages are hoisted, each load being large and the hoisting time short, the peak on starting would be exceedingly great. By using very large fly-wheels, or even two of them, as is often done, the cost of operation would be reduced proportionally much below that of a small installation like this. This system is particularly applicable to a concern that is operating several mines in a district and generates its own power. The generating station can be situated, in such a place, near a railroad, where coal and water may be secured cheaply, or in a locality where water-power may be utilized. In such case a motor-generator set with fly-wheel is installed at each shaft and the size of the main generating station would be proportionally greatly reduced.

Rate of flow through the large 42-frame slime-press at the Homestake cyanide plant, at Deadwood, South Dakota, is close to 520 tons in 24 hours, and the press is idle part of the time.

THE SKIDOO MINES COMPANY

The Skidoo Mines Co., operating a group of 23 claims in the Panamint range, Inyo county, California, has recently entered the list of dividend-paying gold mines. The property lies on the southwestern slope of Tucki mountain at an elevation of about 5500 ft. above sea-level. The country hereabouts consists of a series of rolling hills and gentle slopes, separated from Death valley by a range of Paleozoic limestone hills. These hills are scored by deep canyons.

Granite of post-Jurassic age comprises the principal country rock in the vicinity of the property. Cutting this granite are dikes of syenite-porphyry and smaller intrusive bodies of diorite, quartz-monzonite and porphyry. The auriferous veins are found in fissures in the granite and in shear zones between the granite and syenite-porphyry. The gold occurs free in a quartzose gangue accompanied by limonite, hematite, and some galena. At 300 ft. the ore is oxidized and it is expected that this condition will obtain until a much greater depth is reached.

Work is being done on four veins through two tunnels and two shafts. The maximum depth attained is 300 ft. The average width of the orebodies is 4 ft., the ore running from $12 to $20 per ton, average about $15 per ton. Ore is treated by amalgamation, concentration, and cyanidation, in a 50-ton mill. About 65% of the gold is recovered on the plates. The concentrate, which averages about $300 per ton, is shipped to the Midvale, Utah, plant of the United States S. R. & M. Co. Tailing is cyanided. The total recovery amounts to 90% of the gold in the ore.

Power for the mine and mill is supplied chiefly by water which is brought from Telescope peak, 23 miles distant; 8 and 10-in. pipe being used. The power plant includes also several gasoline engines, used as a reserve in case of trouble with the pipe line. At present there are 40 men employed in and about the mine and mill. Following is a statement of the operations of the company from June, 1909, to June, 1910, inclusive (13 months): tons milled, 14,726; bullion receipts, $189,089; total expenses, $87,661; development, $8819; profits, $92,-617; time lost in mill, 88 days. On August 3, the company shipped to the mint 552 troy ounces of bullion which netted $7595. This was the result of a clean-up of batteries and plates after a run of 13 days. Time lost during the 13 days run was 15 hours.

For the past six months the average cost of mining has been $4.13 per ton; this includes administration and miscellaneous charges. The cost of milling, including administration and cost of power plant upkeep, has been $2.75 per ton. Thus the total cost of mining and milling, including all work about the mine and mill, except development work, has been $6.88 per ton. The second dividend of the company was paid in July, 1910, and amounted to 5c. per share on a capitalization of 1,000,000 shares, or $50,-000. The principal stockholder in the company is E. A. Montgomery, of Los Angeles.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than aerial compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Conical Tube-Mill Grinding

The Editor:

Sir—The comparatively recent use of the conical mill for fine grinding has brought up many questions, especially among actual users of the apparatus, concerning its ultimate limit of efficiency. It seems that this type of mill, while possessing certain attractive features of design which should add to its efficiency, has only been tried out grinding a few classes of ore under somewhat similar conditions. While the manufacturers of the different makes of conical mill are confident that it forms a step forward in the art of fine grinding, they are admittedly doubtful as to its limitations. Further and more detailed data are desirable on this subject, and with this in mind I submit the following figures.

It must be understood that the performance of both mills, as shown by the figures, is based on similar operating conditions, both being run on a hard quartz gold ore. The work shown was done at Polaris, Yuma county, Arizona, and the performance of the different grinding devices was carefully watched by the general manager of the company, while certain adjustments were made by him with a view to securing the best possible results from the machines in use.

SIZING TEST ON ABBÉ TUBE-MILL, 4 FT. 6 IN. BY 20 FT., 30 R.P.M. 75 TONS PER DAY

Mesh.	Feed. Per cent.	Issue. Per cent.
On 20	3.1	...
" 40	15.5	3.2
" 60	15.6	4.5
" 80	14.6	10.5
" 100	9.6	15.8
" 120	2.4	2.4
Through 120	39.2	63.6

SIZING TEST ON 8-FT. SINGLE CONICAL MILL, 25 R.P.M. 75 TONS PER DAY

Mesh.	Feed. Per cent.	Issue. Per cent.
On 20	15.1	3.5
" 40	35.6	21.2
" 60	10.4	14.1
" 80	11.1	17.9
" 100	6.4	11.2
" 120	0.7	1.6
Through 120	20.7	30.5

The conical mill was run at a speed varying from 18 to 30 r.p.m. and experience showed that 24 to 25 r.p.m. gave the best results. An increased speed above this had no beneficial effect, while it probably increased the wear on linings and pebbles and, of course, needed more power. At a speed of 25 r.p.m. about 25 hp. was required. The mill was charged with 3½ tons of pebbles. The Abbé tube-mill was charged with 8 tons of pebbles, which filled it about 6 in. more than half full. Performing the work indicated in the above test 30 hp. was required.

These figures are submitted with the idea that they will prove of interest to engineers in general. It would be helpful to many engineers who are encountering similar problems if other members of the profession would publish accurate data relating to their own experiences.

STUART TOD

New York, July 29.

Crushing by Stages

The Editor:

Sir—It is with some reluctance that I enter into a controversy with so experienced a writer as Algernon Del Mar, especially on a question that cannot be anything but a hypothetical one at best. The so-called 'efficiency' of grinding machines, as of so many other industrial contrivances, is very uncertain, dependent as it is on many elusive factors that nobody can control. If this be true in regard to so widely divergent types as jaw-breakers and gyrating crushers, stamp-mills, and Chilean mills, and of the large number of varieties within the latter class, where the preference for a certain machine develops simply into a question of local conditions, and often personal inclinations and prejudices, how much more difficult, if not impossible, must it be to decide as to the superiority between so closely allied methods as the ones under consideration, namely, grinding in two cylindrical tube-mills, with an intermediate sizing of the product as preferred by Mr. Del Mar, as against grinding in a conical mill alone. The latter, in my estimation, has not been given the proper opportunity to prove its merits (or weaknesses), and Mr. Del Mar himself takes his stand against it on entirely hypothetical grounds. At least he produces no concrete evidence for his preference, and I doubt whether the results upon which he bases his opinion have been recorded with that degree of accuracy necessary to preclude any possible error of judgment.

To do so would be impossible, except with the most scrupulous attention to details, as was demonstrated by the recent drilling contest on the Rand, where the most elaborate precautions had been taken to prevent any bias and the results were recorded with the utmost care. Nevertheless, the decision, in favor of a certain drill, was so unsatisfactory as to call for a second competition, and with so disappointing a result that even the S. A. Chamber of Mines, under whose auspices, together with the Transvaal Government, the trials were held, considers them of little importance, while the Johannesburg correspondent of *The Mining Magazine* pronounces them void of all finality and capable of yielding entirely different results if the contest were to be conducted again under the identical conditions. If this is the result of one of the most scientifically organized tests of modern times—as far as efficiency of mining machinery under actual working conditions is concerned—and if this agrees with the experience we gain every day when we attempt to condemn a machine or method on the strength of an apparent failure under certain conditions, I wonder at the courage of Mr. Del Mar in assuming the rôle of supreme judge when he declares that "the fra-

ternity may have found the weak points of the conical mill and prefers two cylindrical tubes, sizing between, or crushing in two stages instead of in one machine."

That I perfectly agree with him in regard to the value of crushing in stages is made clear in my first remarks (the ones that gave so much offence), and for that reason I consider the principle of the conical mill correct, inasmuch as it is certainly better to perform the work in one machine, when possible, instead of in three. If in actual operation the results should not correspond to the principle involved, after exhausting all possible means to reconcile both, then the machine will be abandoned altogether, or relegated to its proper sphere. That this stage has not been reached yet, I am free to say, and all the more so as there are authorities who favor the conical mill and large enterprises that are perfectly satisfied with its operation. Personally, I have no evidence to offer, either way; and, if I had, I would not consider it conclusive. The fact is that I have never given this matter much attention and was therefore surprised to see Mr. Del Mar make my inconsequential remarks the subject of attack. I still maintain that the principle upon which the conical mill is built has not been sufficiently recognized by the mining fraternity, as is shown by the small number of installations that have been made. Mr. Del Mar tries to prove the inability of the conical mill to accomplish the desired result by doubting that much selective action takes place on the part of the pebbles, and claims that he has learned this from his experience. It would be interesting to know wherein this experience consists, because to me it would seem more plausible to expect considerable selective action owing to the spherical form of the pebbles, which should give the fine particles in the pulp an opportunity to escape the impact between the fewer large pebbles near the inlet (but catching the larger particles) and submitting them to the crushing action of the more closely packed small pebbles near the discharge end. Mr. Del Mar himself admits a 'pronounced' sizing action in the case of dry ore. If so, what right have we to assume *a priori* that all, or nearly all, such action ceases once water is introduced? That the greater fluidity of the water must have some effect will probably be admitted, but in what direction, and to what extent, remains entirely a matter of speculation.

Mr. Del Mar's comparison of the conical-mill principle with that in a battery of stamps of different weights appear to me quite irrelevant. An analogy might be claimed if the ore entered the battery at the end of the heaviest stamp and left at the opposite end, but even then the points of similarity are so few, and those of difference so many, that their comparison seems hazardous. From Mr. Del Mar's uncompromising attitude toward the conical mill one would feel inclined to suspect that his trial with the same must have been disastrous (possibly due to the mill—possibly not). Let it be hoped that such is not the case, and that his rush to the defence of the 'fraternity,' as well as his somewhat peremptory challenge to me, are not the reaction of a pardonable state of mind under such conditions, but his unmixed desire to dispel, in an entirely disinterested manner, any favorable impression in behalf of the conical mill my remarks may have created, because contrary to the truth, as he sees it.

Before closing I should like to state that the omission of the word 'except' somewhat obscured the meaning in my last communication. The last sentence of the last paragraph but one should read as follows:

"If we, then, choose our stamps so that their weight does not exceed that required to accomplish the breaking of the ore, we should have as economical a crushing machine as we can expect, except for the smallest sizes, where stamps would become impracticable, and tube-mills, preferably the conical variety, would take their place."

FELIX CREMER.

Needles, California, August 7.

The Editor:

Sir—There are one or two items that might be added to the discussion on stage-crushing, which has recently appeared in the columns of the *Mining and Scientific Press*. Without taking exception to anything that has been said previously we may safely say that the question is a matter of cost and that efficiency is only of value to the extent that it affects cost. The plant that everyone is striving for is the one in which the treatment cost (including amortization charges) plus value in the tailing shall be the minimum. Bearing this point in mind, the size of the mill and the amount of ore on hand will usually have a greater influence on the selection of equipment than the differences in efficiency that stage-crushing may produce. The largest plants, which must in any case have a large installation of machinery, can look more closely at the advantages of stage-crushing than others. Again, the mechanical problem of transferring the pulp through a long series of machines is a serious one. Either several feet of that never too plentiful mill height must be sacrificed or some sort of elevator must be put in. In the case of stamps, a departure from the usual arrangement, in a single row would be objectionable. An example of how stage-crushing may be carried too far is furnished by a mill equipped with a large crusher discharging to a trommel whose oversize goes to a short head crusher. No grizzly was used ahead of the first crusher. Had a grizzly been used and the first crusher set up one inch, an elevator, trommel, and crusher could have been eliminated and the size of the building materially reduced. The capacity would still have been ample so that one shift could supply the mill for a day. It is hard to see how stage-crushing pays in such a case.

The 'removal of the fines as soon as made,' so frequently urged upon metallurgists, is no child's play, and although theoretically correct, it must not be done until it can be done at a profit. It would seem that each case is a separate problem whose answer reads in dollars rather than in percentages.

L. B. EAMES.

Pueblo, Colorado, August 9.

Concentrates

Most of these are a reply to questions [illegible]

Discovery of cinnabar in the placer mines on Batwaan creek, Benguet, Philippine Islands, is announced by W. D. Smith, chief of the Division of Mines.

Pure aluminium resists corrosion to a remarkable degree, but the presence of silicon in the metal greatly impairs this property of the metal. The greater part of the aluminium manufactured today is 99½% pure.

Tailing is used to fill abandoned workings of some of the mines on the Rand, and in several of them the tailing is run into the stopes through diamond-drill holes bored from the surface. This method prevents the rapid cutting of iron pipes by the sand, which has given trouble in some instances.

Precipitating gold from cyanide solutions by means of cuprous chloride after acidulating the cyanide solution with sulphuric acid is not a new process, but was introduced by P. De Wilde, of the University of Brussels, nearly fifteen years ago. It is known as the De Wilde process.

Stamp capacity is attracting much attention on the Rand. It is estimated that under ordinary conditions (there) a 2000-lb. stamp will crush 20 tons of ore through a 4-mesh screen, the pulp containing about 75% of — 90-mesh product. A standard 22-ft. tube-mill makes an output of 250 tons per day, grinding to a pulp containing not more than 10% of + 60-mesh material.

A secondary vein of quartz sometimes occurs within the large mass of a quartz vein, differing from it in physical appearance, and usually also in value. An instance of this character may be cited in the case of the Clover Leaf (Uncle Sam) mine, on Elk creek in the Black Hills of South Dakota, where an irregular small vein of white quartz occurred, in the midst of a large mass of bluish white iron-stained quartz. The best ore in the mine came from the small white vein, which contained groups of crystals of galena with coarse gold.

A 'packing-block' employed in head-frame construction is a block placed between the minor tie braces of a frame of laminated construction—built up of boards or planks spiked together. The tie braces are either spiked to the sides or are 'let into' the posts and back-braces, and the packing-block is spiked midway of these, and between the two planks forming a tie-brace, its function being to reduce vibration and to stiffen the structure. One or more packing-blocks may be inserted in each tie-brace, depending on the length of the brace.

Quartzite is a quartz sandstone that has been firmly cemented by the infiltration of secondary silica. Generally the silica forms an envelope around the original quartz grains of the sandstone, enlarging them. This can best be seen in a thin section under the petrographic microscope, where each original grain may usually be distinctly seen in outline within the envelope of new infiltrated and crystallized silica. Quartzite is sometimes so completely silicified that in the hand specimen its origin might pass unnoticed, unless a slide were cut for microscope determination. Usually however, in the field quartzite may be identified readily by its appearance in place. Aplite, a fine grained micaless granite, is sometimes so completely altered by infiltration of silica, that it has frequently been mistaken for quartzite.

Concrete is most useful about the mine, either underground or on the surface. Foundations, retaining walls, bulkheads, shaft and tunnel linings, floors, side-walls, battery-blocks, and other structural features can be made of concrete. Reinforcing it with bars of iron or steel, or sections of old hoisting rope greatly strengthen the concrete. Excellent tanks for holding water or fuel oil can be built of concrete, either in a pit beneath the surface or merely resting upon it. Not long since the city of New Ulm, Minnesota, had constructed for the municipality a reinforced concrete tank, or reservoir, with a capacity of 1,000,000 gal. It is cylindrical in form, 75 ft. diam., and 30 ft. high, with a conical concrete roof. The concrete was made of screened gravel of sizes from ¼ to 2½ in., with a mixture of coarse and fine sand, and cement in the proportions 4-2-1, respectively. The reservoir is above ground and is water tight.

Ventilation while driving an adit is often poor until a raise can be made to the surface from some point well in the adit. When the drift advances beyond the raise the circulation of air will probably become poor again, but will be aided somewhat by the air currents between the mouth of the adit and the raise. Circulation may be much improved by carrying a 10-in. pipe, either of wood or iron, well toward the face of the working, the outer end extending upward, like a chimney. The air current will flow into the tunnel and out through the pipe. A raise will not then be necessary. If there is much wind, this may be utilized by placing a triangular sail above the pipe, the cloth converging to the mouth of the pipe like a funnel. This sail must be adjustable so that it can always be set facing the direction of the wind, which will drive down the pipe to the face and out of the tunnel, the natural direction of the current being reversed. Still another method may be employed by building at the mouth of the adit a furnace of rocks plastered with mud. The furnace is provided with a stack, and the pipe from the adit is entered beneath the grate to supply the draft. Beneath this pipe construct a door, for natural draft which can be closed. When the fire is well under way, close the door, and the air-supply to keep up combustion will then be drawn from the adit through the pipe, pure air from the outside flowing in, to supply its place, thus establishing a continuous circulation. When the furnace and pipe are of liberal size this method of ventilating either adit or shaft, is very effective.

Special Correspondence

LONDON

Electricity on the Rand.—Foldal Copper & Sulphur.

The great progress of electrification of machinery on the Rand has drawn attention once more to the history and present position of the Victoria Falls & Transvaal Power Co., which has done so much to bring about this desirable economy. The company was formed in 1906 under the auspices of the British South Africa Co. to establish power-supply stations in the Transvaal and Rhodesia. The primary object was to utilize the Victoria Falls on the Zambesi river, and secondarily to establish steam-power installations on the Rand. For various reasons the first part of the program has been postponed and operations were centered on the latter. The steam-plant of the General Electric Power Co. at Driehoek was acquired and also that of the Rand Central Electric Works at Brakpan in the East Rand. Subsequently another plant was erected at Simmer Pan, and plans have been completed for a third at Rosherville. The Brakpan plant was put into commission in the early part of 1909 and the first part of the Simmer Pan plant the following July. The Simmer Pan plant has been extended and the capacity is now 27,400 hp.; also the Brakpan plant has been increased by 9700 hp. The Rosherville plant will consist of five steam-turbine sets of 9600 kw. each and four air-compressors of 4000 hp., each driven by steam-turbines; part of this will be ready at the end of 1910 and the rest at midsummer 1911. The business of the company is extending so substantially that another installation is under consideration. For this purpose an agreement has been made with the Vereeniging Estates and Lewis & Marks for the erection of a 53,600-hp. installation on the Vaal river, the contract calling for the purchase of coal from the companies named. The prosperity of the company has also made it impossible to discard the old Driehoek plant which is neither up-to-date nor economical. The total capacity of the plant will eventually be 155,100 hp. for electric current, and 16,000 hp. for air-compression. The amount of current supplied will be 500 million units per annum. The distribution lines will extend from the West Rand Consolidated to the Cloverfield in the far east, a distance of 45 miles. The directors speak in flattering terms of the prompt delivery of plant by the Allgemeine Elektricitats Gesellschaft of Berlin, which company secured the contract. It is notable also that much of the capital has been supplied in Germany, the issue of £900,000 debentures a few months ago having been taken by the Deutsche and Dresdner Banks. The capital has been continually increased as required for the building of the plant, and now stands at £1,000,000 in ordinary shares, £1,838,000 in 6% cumulative preference, and £1,700,000 5% debentures.

No profit and loss account has been submitted, seeing that the company is at present occupied chiefly in construction, and the profits of existing plant are carried to the balance sheet. The first installment of preference dividend will probably be paid in May next. The saving both in capital outlay and in cost of power to the companies using their current is remarkable. At City Deep, for instance, the saving in initial outlay was £124,000, and generally the saving in power bills is from 6d. to 1s. per ton crushed. Recently Bernard Price, an engineer of experience in the application of electric power to collieries in the North of England, has been appointed engineer in chief to the company in South Africa.

The Foldal Copper & Sulphur Co. was formed in 1906 to acquire an old mine at Foldal, Norway, containing cupriferous pyrite valuable chiefly for its sulphur content. The property was examined by F. Robellaz, Stanley E. Clay, and W. H. Lund. The first-named is now manager, and W. A. Carlyle is consulting engineer. The first thing to be done by the company was to put the old workings in order. Insufficient support had been provided and at the same time much of the ore had been left behind on either or both walls. In order to make the workings secure the old stopes from No. 2 level to the surface have been filled by flushing in sand and fine rock. About 120,000 cubic metres of this material has been used. The main workings consist of three adits 3500, 3400, and 1500 ft. long respectively, together with winzes, raises, and cross-cuts. Three inclined shafts have been sunk from No. 2 level at distances of 200, 1685, and 2855 ft. from the entrance. No. 3 level is to be driven at the depth of 200 ft. vertical or 250 ft. on the incline, below No. 2 level, and the work of driving from the bottom of each inclined shaft has already been begun. The shafts are in ore all the way down and if the drifts continue in ore, it will be safe to estimate the reserve between the two levels at 300,000 tons. By the end of the current financial year it is hoped that the reserve will be sufficient to provide a regular supply of 110,000 tons per year. During the year ended February 28, 97,503 tons was mined, and after dressing part of the ore, 67,453 tons was shipped. The average content was 46.6% sulphur and 1.813% copper. The profit on the sales was £13,356. From this has to be deducted London expenses £2440, and interest on loans, debentures, etc., £7480, leaving a balance of £3447, which has been used for reducing the formation expense account. The company is weighted with capital, there being £110,000 in preference shares and £200,000 in ordinary shares, £22,700 debentures, and a loan of £49,212. No dividend has yet been paid on the preference shares; as the dividend is cumulative at 6% the arrears are mounting. The prospects for the future depend on the luck of finding wide lenses of ore. At present the veins are from 1 to 3 ft. wide, but there is always a chance of finding much wider parts, for such formations are common in Norwegian pyrite deposits. The resources may also be increased by finding parallel veins of importance; cross-cutting has already revealed the existence of such veins and further research is to be undertaken by means of the diamond-drill.

MURRAY, IDAHO

New Transportation Brings Prosperity.—Monarch.—Paragon. — Jack Waite. — El Dorado. — New England Exploration Co Tests Placers.—Forest Fires.

The two forks of the Coeur d'Alene river divide the mining district of the Coeur d'Alene into two sections—the South and North. Wardner, Kellogg, Wallace, Burke, and Mullan are ranged along the South fork and its tributaries, while the Murray region is on Pritchard creek, which flows into the North fork. The towns, mines, and mills of the South fork have had railroad facilities for more than twenty years, the Northern Pacific from the east, and the O. R. & N. from the west meeting at Wallace. Both systems operate branch lines from Wallace to Burke, serving such mines as the Federal group, Hecla, and Hercules in the Canyon Creek section. The Northern Pacific, which passes through Mullan, provides spurs and sidings for the Morning, Gold Hunter, Snowstorm, and other mines. In the vicinity of Kellogg and Wardner the O. R. & N. affords shipping facilities to the Bunker Hill & Sullivan, Last Chance, Stewart, Caledonia, and others. The North fork country was provided with a railroad less than two years ago, when the Idaho Northern Railroad Co. finished the building of a line from Enaville, a distance of 22 miles up the North fork, thence 11 miles up Pritchard creek to the mouth of Paragon gulch, passing through Eagle, Murray, and the camp of the Monarch mine. While this branch is a part of the Harriman system, it is operated as a separate line, and its construction was largely due to the efforts of E. P. Spalding, vice-president and general manager for the company, who sought to hasten the development of the Murray and Pritchard creek mines. The first comers to the Coeur d'Alene country were placer miners who worked on Pritchard and its tributary streams. This kind of work was soon supplemented by the opening of quartz veins of free-milling gold ore in the vicinity of Murray, and a number of such properties were equipped with stamp-mills and operated at a profit. Among them was the Golden Chest, now closed, but rated as a meritorious mine. In the deeper

workings the ore secure rapid and will this change cause difficulties in milling. Within the last eight or ten years much attention has been given to the development of lead properties in that section both in quartzite and slate formations and the establishment of railroad transportation has given operations a healthful impetus. The side canyons which drain into Pritchard creek expose the formations and the mineral croppings. Among these are Eagle, Butte, Bear, Paragon, and Barton gulches on and contiguous to which are the bases of most of the mining operations.

The Monarch mine situated on the mountain ridge between Barton gulch and Pritchard creek has been developed by about 12,000 ft. of work, consisting of cross-cuts and winzes and drifts on the principal vein which is in quartzite. The major part of this work was done by the Monarch Mining Co., which within the last three years sold its majority interests to the Coeur d'Alene North Fork Mining & Smelting Co., for which E. P. Spalding is president and manager. The company's holdings consist of 30 claims between Pritchard and Barton creeks, and 15 claims on the north side of Pritchard, the development being wholly on the former group. It is stated that over $400,000 has been expended on the property in development and equipment. The discovery shaft, and No. 1 and 2 cross-cuts are on the Barton gulch slope. No. 2 cuts the vein 400 ft. from the portal and on that level is 450 ft. of driving on the vein and a 250-ft. winze. A blind level 500 ft. long was also driven on the vein from the bottom of the winze, this being designated as the 600-ft. level. No. 3 cross-cut starts on the Pritchard creek side, about 80 ft. higher than the bed of the stream, and was driven 3266 ft. southerly through quartzite, cutting the Monarch vein 1400 ft. below the collar of the discovery shaft. To cut the oreshoot on this vein a diagonal was driven from the main cross-cut which opened the vein several hundred feet east. At this point an 875-ft. raise was made on the ore and a connection was thereby made with the 600-ft. level mentioned above. Levels were also driven from the 900 and 1000-ft. stations of this raise, and these are said to be in ore. Starting near the base of the 875-ft. raise a drift was run east 300 ft. in ore, and at the face of this drift another raise is to be made 200 ft. on the orebody to establish there an intermediate level. No. 3 cross-cut is used for ore haulage and drainage. The ore is dumped into bins at the mouth of the cross-cut, and from the bins it is passed by gravity to the company's concentrating mill, which is operated by water-power and is concentrating 60 to 75 tons of ore per day. The mill equipment consists of a crusher, two sets of rolls, trommels, jigs, tables, and vanners. The intention is to install additional equipment this season, so as to bring the mill capacity up to 200 tons per day; the new machinery is to include a Huntington mill for re-grinding the middling from the fine jigs. The mill machinery is driven by a 5-ft. Pelton wheel, under pressure of 950-ft. head of water delivered from a 2100-ft. pipe-line and a one-mile flume. The air compressor and a No. 5 Buffalo suction fan are operated by a second Pelton wheel under 135-ft. head of water. The fan is constantly used for keeping the workings ventilated. Since January 1, 1910, eight cars of concentrate have been shipped to smelters; this sampled 60% lead and 12 oz. silver. The ore carries some zinc. The company has a force of 30 to 40 men employed.

The Paragon Con. Mining Co., which has absorbed the holdings of the Paragon and Chicago-London interests, has 42 claims on Paragon gulch, and is developing at two points. At one of these is a 300-ft. shaft and considerable other work in the way of cross-cuts, raises, and driving on the vein. At the other place is a 600-ft. cross-cut to the vein and 600 ft. of driving thereon. A raise has been started from this level to connect with another level 250 ft. higher. The country rock here is quartzite, the ore consisting of galena in a quartz and quartzite gangue, accompanied by some silver and zinc. The company has a 15-drill air compressor, operated by water power, the water coming from a 3200-ft. flume through a 24-in. penstock, driving the 10-ft. Pelton wheel with 205-ft. head. The shaft-house and head frame and all other equipment at the shaft were demolished last winter by a snowslide, and this equipment is being replaced. An auxiliary steam plant is to be installed to operate the air compressor. L. W. Stedman, manager for the company, has been in charge here for ten years and was the original locator of many of the claims. The company is made up of St. Paul, Minnesota people who have shown great persistence. The railroad terminal is within 1000 ft. of the Paragon camp. The Black Horse mine, controlled by P. Burke and others, is also situated on Paragon gulch, and the development and tonnage of ore exposed were sufficient to make the owners feel warranted in erecting a concentrating mill, the machinery for which has been delivered at the railway terminal. The construction work is in progress. An aerial tramway, half a mile long, is to be built from the mill to the mine.

The Bear Top mine and concentrating plant are situated on Bear gulch, 3½ miles from where the latter opens into Pritchard creek. The mine is high above the bed of the gulch, having one principal east-west vein in quartzite and slate. It is opened by a series of cross-cut levels, the vertical distance between the highest and lowest levels being 600 ft. The vein has a dip of 70°, and has a width of 15 to 18 ft. Ore of the highest grade, 60 to 70% lead, is hauled to the railroad and shipped; the mill ore is said to carry 15 to 18% lead. The silver usually amounts to

Headquarters Paragon Mine.

half an ounce to each per cent of lead. There is also a considerable amount of zinc. The lowest cross-cut connects with the upper terminal of an aerial tramway, over which the ore is transported to the concentrating mill, which is operated by water-power. In the mill are 1 jaw-crusher, 3 sets of rolls, revolving screens, an elevator, 2 sets of jigs, 4 Wilfley tables. The Bear Top has been in operation several years, and George Kebler, the manager, has been in charge during the last two or three years. The Orofino is situated in Bear gulch adjoining the Bear Top, but it is not active at this time.

The Jack Waite group is noted in this section for the high grade 'steel galena' ore which it produces. The property is under bond to the Jack Waite M. Co., which is controlled by Patrick Burke and associates. Its location is 12 miles from Murray, at the head of Tributary gulch, the latter draining into Eagle creek. The principal vein is 6 to 8 ft. wide, between quartzite and slate, and the ore comprises some lead carbonate as well as steel galena. Work is in progress and the intention is to haul the high-grade ore to the railroad.

The El Dorado, situated up Butte creek, but close to the summit, has been developed by John Murphy, M. Malley, and Charles Sullivan, who have gold-bearing quartz. The Grant & Allie, on Granite creek, is being developed by John Steen and others, who have sunk a 200-ft. shaft, opening a vein between syenite and quartzite; they are operating a small concentrating mill on lead and gold ore. The Golden Winnie, close to Murray, has just started a small mill on the property for concentrating an ore that carries gold and tungsten. The Idaho Northern group, situated on Butte gulch, has one vein that is on the contact of slate and quartzite, and another vein that cuts the contact at right angles. This belongs to E. W. Barton and Otto Nordquist, of

Murray, who are said to have found galena ore, with streaks of copper. They are building a 2400-ft. flume for the purpose of developing water-power for an air-compressor.

The New England Exploration Co., represented by Bulkley Wells and R. E. Cranston, is testing the placer grounds of Pritchard creek from its mouth a distance of ten miles up stream. The property belongs to the Coeur d'Alene Mining Co. of Boston. The latter company did considerable work at one time, sluicing some of the placer material by the aid of an Evans hydraulic elevator. The depth of the gravel to the slate and quartzite bedrock is said to be about 30 ft., and it forms a strip 200 to 250 ft. wide.

What is believed to be an important body of cinnabar has been located on the upper course of the North fork of the Coeur d'Alene river, and the locations are said to be now in control of an Eastern company. Destructive forest fires have been burning in the North fork and Pritchard creek sections for a week, and vast areas of timber have been destroyed. At one time every available man employed on the mines was engaged fighting the flames. During two days the Bear Top, Monarch, and Paragon mine and mill buildings were closely menaced by the approaching fires, but the progress of the flames has been checked and most of the property made reasonably safe. There has been virtually no rain in this part of the Northwest for two or three months and the drought is severe.

LOS ANGELES, CALIFORNIA

American Mining Congress.—American Oilfields Gusher. — Lone Pine.—Clara Consolidated.—Haynes Copper Company.

Believing that some policy of conservation with respect to oil lands will be put into effect, a number of prominent oil men of this city held a preliminary meeting last week to discuss the situation and formulate plans to present the matter, probably in the form of a concrete resolution, at the annual meeting of the American Mining Congress. The idea is to forestall any action unfavorable to the industry by suggesting something that will, while fulfilling the demands of conservation, permit unhindered development. The result of the meeting was a decision to issue a call for a public meeting, to be held at Los Angeles on a date to be selected by the chairman, S. C. Graham. The following telegram from Gifford Pinchot has been received by Sidney Norman, chairman of the convention committee of the Mining Congress: "Will reach Bakersfield September 11 or 12 for trip through oilfields. Mail me immediately literature describing situation very fully and keep me constantly advised. Regret exceedingly Mr. Roosevelt cannot come but absolutely impossible. Good luck."

The following official statement of the action of well No. 79, of the American Oilfields, which has been reported from various sources as flowing as high as 25,000 bbl., or more, during the past fortnight, will be of interest. Well brought in during May, 1910, at 1000 bbl. per day, increasing to 3000 bbl. July 25. From July 26 to August 4, excepting one day when well sanded, flow ranged from 8000 to 10,000 bbl. August 5 flowed at the rate of 20,000 bbl. in the morning, averaging 15,000 bbl. for the day. August 6, 7, and 8, average flow 16,000 bbl., reaching a maximum of 20,000 bbl. on the morning of August 8. The total yield from July 26 to that date was 143,200 bbl. Advices from the well on August 13, were that there was trouble with the well sanding.

A mill is planned for the Lone Pine zinc mine at Good Springs, seven miles from Jean, Nevada, on the Salt Lake railroad; also a railway from the main line to the mine. The mill will be built at some point on the railroad, probably near Jean. W. D. Longyear, of this city, is heavily interested. Work is being rushed on the Mudersbaugh property, south of Bouse, Arizona, recently purchased by George Mitchell of this city. Already a large force of men is at work installing two hoisting plants and an air-compressor. From 15 to 20 tons of copper ore are being hauled to Bouse daily and from there shipped to Swansea. At the Clara Consolidated, Swansea, a 175-hp. hoisting plant is being installed at shaft No. 5. This shaft is now bottomed at 180 ft., and is going down at the rate of 5 ft. per day. Work is being pushed on the new pumping plant. When the water supply is made permanent, which will probably be accomplished within the next four weeks, there will be nothing to hinder the continuous operation of the smelter.

Ore carrying copper, lead, gold, and silver, has been found at 200 ft. in a cross-cut tunnel on a prospect at Mineral Park, Mohave county, Arizona, operated by Carlton H. Hand and E. E. Peck of this city. The vein has been penetrated 6 ft. and the hanging wall has not been reached. If developments are favorable this property will probably be turned over to the International Mines Development Co., recently organized by Mr. Hand and associates. Word has been received of the discovery of rich copper sulphide ore at the property of the Haynes Copper Co., operating at Jerome, Arizona. The ore was found at 413 ft. in the east cross-cut on the 700-ft. level. Thirty feet have been driven in the orebody, 3 to 4 ft. wide.

VANCOUVER, B. C.

Portland Canal District.—Character of Orebodies.

The Portland Canal district is attracting much attention here. A recent visitor reports that as far as could be judged by the showings made on the different properties

inspected, this district is one of excellent promise. To a mining geologist, the formation to be found in the vicinity of Bear river, and its tributary creeks, looks favorable. Generally speaking, the country rock is a schistose argillite, intersected in various directions by dikes and intrusions of igneous rocks, some of which are decidedly porphyritic. The orebodies vary in structure and composition. From the limited amount of work done it is difficult to de-

formation closely to the [illegible] of ore deposit the [illegible] belong. In the Portland Canal mines including the O. K. Little Wonder and Silver properties the veins appear to be interbedded with the formation or to cut it at a low angle. The chief minerals are iron pyrite galena zinc blende and occasional native silver. The gangue is chiefly quartz, sometimes with a considerable amount of calcite. Silver is the chief metal of value. On the middle fork of Glacier Creek [illegible] are similar occurrences but another class of vein is also present. There are vertical fissures, containing crushed barite in the gangue and cutting the formation almost at right angles. The chief constituent minerals are galena gray copper iron pyrite and stibnite. The value of the deposit of this character lies practically altogether in silver. The veinlets and shoots of gray copper assay in places over 2000 oz. per ton. Veins carrying compact galena are found at several points in the district. These are generally high in silver, but those at the head of Salmon river, carry gold as well. Gold is found in various places in quartz veins, and is generally associated with iron pyrite. Another class of ore deposit is that found on the Red Cliff, near the mouth of American creek. It consists of large mineralized zones of chalcopyrite and iron pyrite. Here the silver content is low and the gold high. Further up American creek bornite, zinc blende, and chalcopyrite occur associated with barite. Silver sulphide is probably present as well, as the silver content is high. Such ore is found on the Rangoon Bandolier group. The outlook on the whole for prosperous mining is good.

NEW YORK

Curtailment Results. — Miami Copper Co. — Greene Cananea.— Tanganyika Concessions.—Cobalt Stocks.

There is a saying of an ancient law-giver that a powerful man is never feared so much on account of what he does as on account of what he may do. The weight of the copper surplus has been a millstone, an old man of the sea, all kinds of burden, feared for its power for evil. When, during the past month, the curtailment policy instituted by the producers began to make itself felt and a more favorable copper report was assured, it might have been expected that the copper situation would have been a general centre of interest and that the final mastering of the accumulated stock problem would have been general matter of congratulation. The public has ways much like crowds upon the city's streets, and the moment an unusual event is over and things assume a conventional aspect the crowd loses interest and melts into the ordinary passing throng. Analyses of the copper surplus, its causes and its effects, have been many. When the July report showed an increase of but 2,254,661 lb., accompanied by figures from London showing a decrease in visible supply of 10,568,320 lb., or a net decrease in the world's surplus of more than 8,000,000 lb., the public, seeing the end of any acute trouble from present accumulation, turned its attention to speculating upon the legal right of the producers to curtail. While there is no doubt that the authorities at Washington have been watching the copper magnates narrowly, especially in view of the application made by J. P. Morgan and some of his associates some months ago for permission to put the copper merger together, it is plain that the curtailment policy will have to show more signs of concerted action than it does at present to justify any admonition by the Federal Department of Justice. The Imperial Copper Co. of Arizona shut down because the Development Company of America is temporarily unable to further finance the property and meet its requirements for enlarged development. The Balaklala, now known as the First National Copper Co., has shut down on account of smelter-fume trouble. On the other hand, the Phelps, Dodge & Co., Inc., turned out last month more copper than in any previous month of the year. The Calumet & Hecla output for July was 10,507,713 lb., as against 10,742,250 for June. Next month's Association figures should show how fully the agreement to restrict is observed. As these figures cover smelter and refinery output [illegible] than the actual mine production of each month a month or two must elapse before results are plain. The meeting of the Copper Producers Association this month was held with T. L. Livermore in the chair for the last time. It is no small tribute to Mr. Livermore that the members of the Association though they have known for some weeks of his impending retirement have not as yet chosen his successor. It is expected that the stockholders of the Miami Copper Co. will in the near future be asked to authorize an increase in the capital stock. Miami has some ambitious plans. The mill is to be larger than was at first planned some additional ground is to be acquired. There have been some surmises that the increased capital was to be used in taking over the New Keystone Copper, which, like the Miami, is one of the promotions of the General Development Co. This, however is denied, the present plans do not include the immediate absorption of the New Keystone, though a further increase of stock will probably be made later for this purpose. Miami has a capital of 700,000 shares, par value $5, of which 600,000 shares are outstanding, 88,000 held in reserve against the present bond issue of $1,500,000, and 12,000 remain in the treasury. The bonds are convertible into stock at $19, a large part of the original issue has already been exchanged.

The passing of the Cumberland Ely Copper Co marks another step in the general progress made toward the inevitable final copper merger that is to come as an evolution. The stockholders of the Cumberland Ely are being asked to instruct the directors to sell all of the property, distribute the proceeds, and wind up the corporation. The rapidity with which copper production and copper properties are concentrating in a constantly decreasing number of hands is marvelous and not appreciated unless the progress of the past two years in this direction is noted. That Nevada Consolidated will be absorbed, even as it absorbed Cumberland Ely, is almost an inevitable consequence. Later Utah Copper will undoubtedly take over Ray Consolidated, which is just now in turn assimilating the Gila. It does not require a very prophetic vision to see a day when the part of the individual in copper mining will be simply the primary exploitation of new properties. The control of the smelters will give to the present powers a whip hand that will not allow any independent producer to grow into a dangerous competitor. In order that the Cumberland Ely shareholders, of whom there are now but a few, may not find themselves sold out without any alternative, the Nevada Consolidated Co. is keeping open its original offer to exchange one share of its stock for three and one-quarter shares of Cumberland Ely.

The Greene Cananea Copper Co.'s output for July was 4,500,000 lb., the best month the property has had under the Cole-Ryan management. The precious metals are of great help of the Greene Cananea; the silver recovered in July amounting to 119,000 oz. and the gold to 545 oz. The rebuilding of the scrap heap which was taken over from William C. Greene is practically complete, though the attention to some further minor details is necessary to economy of operation. Greene Cananea copper costs are between 10 and 11c. This figure must be cut down before any great profit can be earned, and Greene Cananea's $50,000,000 of capital stock must be cut down also before such profits can be distributed as dividends at anything like a satisfactory rate.

The recent shipments of copper matte, received from Africa at Perth Amboy, and which were erroneously thought to be the first consignment of a large accumulation of metal produced by the Tanganyika Concessions, Ltd., has made this concern a subject of some attention. 'Tanks,' as the issue is known on the London Stock Exchange, owns an extensive property in the Belgian Congo, or rather it operates such property through a Belgian corporation, the Union Minere du Haut Katanga, 45% of the stock of which is owned by the Tanganyika Concessions. The properties, consisting principally of three mines, the Kansanshi, the Star of Congo, and the Kambove, are now connected with the east coast by rail. The present management estimates an annual production of 135,000,000 to 200,000,000 lb. of copper

within three years. A smelter is being erected at the Star of Congo, and general equipment provided to insure a low-production cost. The freight item is the company's real problem. The rail haul to Beira on the coast is a long one, and no economy of operation can so cut this item that it will not absorb a material part of the profit on the metal output.

While the Cobalt share market refuses to be stirred into life, regardless of whatever stimulant may be applied, there are some really important discoveries being made in the camp. La Rose has opened a rich vein on the Princess lot. It was found at a depth of 135 ft., is 3 in. wide, and assays 3700 oz. per ton. There is a well defined rumor that the La Rose dividend, some months ago cut from 16 to 8%, is soon to be restored to the original rate. The cumulative effect of these two items was insufficient to start any uplift in La Rose. Cobalt's great dividend payer, the Temiskaming & Hudson Bay, has also made a rich discovery on its property near the Nipissing line, and is sacking some rich ore. The shares, of which there are but some seven thousand outstanding, have a par value of $1, and sell for $100 to $105. The company is building a 60-stamp mill.

A valuable mining concession has been granted to a New York syndicate by the authorities of Asiatic Turkey, subject to the ratification of the Turkish Parliament, in November. The concession permits the syndicate to explore the mineral resources and the oilfields of Kurdistan and the valleys of Tigris and Euphrates. Among those interested in the operations of the syndicate are E. C. Converse, president of the Bankers Trust Co.; C. A. Moore, of Manning, Maxwell & Moore; A. F. MacArthur, president of MacArthur Brothers & Co.; Franklin Remington, of the Foundation company; all of New York. The plans of the syndicate also contemplate the building of a railway through Asiatic Turkey, some 1200 miles long, at an estimated cost of somewhere between $60,000,000 and $100,000,000. The work is to be carried on through the Ottoman American Development Co., a New Jersey corporation, with a nominal capital of $500,000, which has been organized for the purpose.

JOHANNESBURG, TRANSVAAL

Record Yield. — Loss of the Chinese. — Illicit Gold Traffic. — Northern Transvaal's Mineral Wealth.

The gold output of the Transvaal for the month of June has been declared at 625,181 fine ounces, or in value £2,655,602. The contribution of the Witwatersrand was £2,541,584, while the outside districts (Heidelberg, Lydenburg, and Barberton) produced £114,018. Compared with the previous month there is a decrease for the whole Colony of 8989 oz., or £38,183, the Rand's decline being £35,617. When, however, the fact that June was only a 30-day month is taken into account, the return must be considered most satisfactory. The average daily yield for last month was £84,719 as against £83,135 in May and £84,153 in April. The rate of profit earning was £27,750 per day as compared with £27,657 in May. In point of fact the June output was the best ever declared by the Colony for a 30-day month, and the recent performances of the mines, combined with the fact that two or three new and large plants are almost ready to commence working, encourages the belief that the output for the current year (always provided that the native labor position does not become less satisfactory than at present), will constitute a great improvement over the 1909 return. The repatriation of the Chinese laborers who wrought so much for South Africa in general and the Rand in particular, has necessitated the most unceasing efforts to make up for the deficiency occasioned by their departure. At the end of May last the gold mines of the Transvaal had over 200,000 native employees, so that in point of actual numbers the loss of the Chinese has been more than made up by unskilled laborers recruited in Africa; but in so far as efficiency is concerned, the labor forces of the Rand have suffered severely. In order to counterbalance the wastage, natives have been recruited from almost every part of South and South Central Africa. Large numbers have been drawn from the distant North and the majority of these have proved to be inefficient. It is, of course, scarcely to be expected that a raw savage will quickly adapt himself to the intricacies of mine work. Since these laborers sign short-time contracts only, their term is completed just when they commence to do really satisfactory work, and at mines where of necessity labor of this class has been employed, results have by no means been satisfactory. The Consolidated Gold Fields of South Africa subsidiaries have suffered severely through the employment of inefficient labor of late. The profit earned by the eight productive mines of the group last month was £113,170. With the exception of the Luipaards Vlei estate and the Nigel—the two least important producers—the profits in comparison with May are lower all round. An official note attached to the returns states that "This is due to the general shortage of native labor, especially in the case of the Simmer & Jack, Simmer Deep, and Jupiter." There can be no denial of the fact that despite the large number of 'boys' now coming into the Witwatersrand compounds, the labor position leaves a great deal to be desired.

In order to minimize the amount of gold stolen some of the most important mining houses have combined in organizing a staff of thoroughly trained detectives, whose duties will be to watch all persons suspected of illicit dealing in gold and also to visit clean-up and retorting rooms, extractor houses, etc., and in various other ways to endeavor to check the evil and convict culprits. One of the most efficient members of the Criminal Investigation Department of the Transvaal, has been placed at the head of the organization and those responsible for the creation of the new mines staff are hopeful that a large amount of the precious metal, which is today finding its way through illicit channels to the East African coast, Zanzibar, and India, will in future not be lost to the industry. Responsible mining men have at different times expressed the opinion that as much as 10% of the Rand output is being stolen. Since the output is now roughly about 600,000 oz. per month, this would mean about 720,000 oz. (or in value nearly £3,000,000) per annum. This is scarcely believable. Were illicit gold buying and selling being carried on to an extent anywhere approaching these dimensions, the methods of the thieves would surely be detected, and the police courts and goals would be full of those awaiting trial or convicted criminals. Moreover, it is scarcely reasonable to think that the trade is sufficiently well organized to handle such an enormous amount of gold. As a matter of fact cases of gold stealing or illicit gold buying, while not uncommon, are by no means frequent or numerous in the Rand police courts. It is admitted that a certain amount is stolen but it is scarcely possible that anything like 10% of the production falls into the hands of thieves. However, the new staff of mine detectives can undoubtedly do something toward minimizing the illegal trade, and if only one-half per cent is being stolen and one-half of this is recovered, the new organization will afford a profit.

When the railway lines which are now being constructed in the northern Transvaal are completed, industry, both mining and agricultural, in that highly promising but little developed part of the Colony, will be greatly stimulated. One line is to be carried on from Pietersburg to the Limpopo river where the Messina mine, the most important copper property in South Africa, is situated. Hitherto the development of the lenticular deposits at Messina has been handicapped by lack of transport, the property being about 140 miles distant from Pietersburg, hitherto the nearest point on the railway. With a direct line to Delagoa Bay, however, the company will be able to greatly increase production. Apart, also, from the benefits that will be secured to the copper and gold mines, and the farmers of the Zoutpansberg district through having cheap and rapid means of transport, the Selah Railway Extension, which is now being built, should usher in a new industry in the production of mica. There are 60 miles of micaceous country in the vicinity of the Olifants river situated close to the proposed route of the new line. Much of this mica is said to be of good quality and preparations are being made to work the deposits on a large scale when the new line is opened.

BUTTE, MONTANA

Western Federation — Keating Stock — Butte Mines — Davis Daly — Philipsburg District

It looks as if the Western Federation of Miners proposes to wage war on the [illegible] Lake Superior district, the object being to compel the mining companies of Michigan to pay the same wages as paid by the Amalgamated company in this district. A few weeks ago the story was given out that the Western Federation in ordering that an assessment of day's wages be levied on every miner within the organization was for the purpose of fighting the Amalgamated, a report which caused much surprise and comment in view of the fact that everything is peace and harmony between the miners and the big concern operating in this district. However, the whole matter has been set at rest by the return of the delegates who declare that the assessment is for the purpose of organizing the Lake Superior district and requiring that the Calumet & Hecla and other companies pay the same wages as the Amalgamated, thus placing the big companies of the Lake district and the big companies of this district on the same footing in the competition of the production of ore.

The Keating Gold Mining Co's stock is soon to be listed on the Boston curb and there is a rumor that a dividend will be declared before the close of the year. A contract has just been signed whereby the East Butte agrees to treat all the ore of the Keating for the next three years. Heretofore the company has been limited in its ore shipments to the amount of ore other smelters would take for fluxing purposes, and it has not been able to ship more than 50 tons per day. The shipments are to be increased to 100 tons per day, and it is expected that later they may be further increased. The East Butte needs a considerable quantity of iron ore for fluxing, and as the Keating runs high in iron the contract will be an advantageous one for the East Butte, while it is stated that the iron in the Keating will almost pay for the smelting. A gold value of $19.20 per ton has been announced on some shipments lately made. The East Butte Copper Mining Co. is now giving up practically all of its smelter to the treatment of custom ores. The company is carrying on extensive development, and the ore going to the smelter at present is only that which is hoisted in connection with this and what is required to keep the smelter supplied after the custom ores are cared for. The Butte-Ballaklava company, while in a position to increase its shipments, has announced that it does not propose to do so under the present conditions of the copper market. At the present time it is shipping about 125 tons per day with an average of about 8% copper in addition to a good silver content. The Tuolumne Copper Co. continues to ship about 100 tons of ore per day and at the same time do a considerable amount of development. Like other independent companies, the Tuolumne is not making any effort to hoist any large quantity of ore under present copper market conditions.

The Corbin-Pennsylvania company at Corbin, which is a short distance east of the Alta and on the same vein, is doing a large amount of development with good results. This property was worked to a considerable extent some years ago, but operations were suspended owing to a lack of capital. When the Corbin-Pennsylvania company took the property the old shafts and workings were cleaned out and some excellent veins opened. In one of the veins chalcopyrite ore assaying more than 6% copper and 12 oz. silver per ton was cut. The Boston & Corbin company is reported as doing some fine work in sinking. During the month of July a little over 100 ft. was made in shaft sinking. On the 700-ft. level recent driving resulted in opening some good ore.

The latest advices received in this city from P. Augustus Heinze are to the effect that he is in Holland and is not meeting with the success he anticipated in raising money. No one here is in a position to say when he will return. The Colorado mine of the Davis-Daly company is still idle, so far as the hoisting of ore is concerned, and no word is expected for the resumption of active operations until Mr [illegible] [illegible] [illegible]

General Mining News

ALASKA

The official report of the Alaska Treadwell Gold Mining Co. for the month ended July 15, is as follows:

Mill time elapsed, 30 days; running time, full mill; 240-stamp mill 28 days, 3 hr., 43 min.; 300-stamp mill, water power 28 days, 3 hr., 10 min. Tons of ore crushed, 240-mill, 32,452; 300-mill, 44,660. Tons concentrate saved, 240-mill, 600; 300-mill, 750.

Estimated gross value of free gold	$115,126.45
" " " " concentrate	77,900.62
" total production	$193,027.07
" " realizable value	$183,775.81
Operating expenses	87,299.37
Net operating profit	$96,476.44
Construction expenses, etc	18,576.57

Yield per ton of ore milled, $2.50.

Development work: 748 ft.; 1250-ft. level, 66 ft. in vein matter; average assay value, $1.11; 1450-ft. level, 579 ft. in vein matter; average assay value, $3.30; 1600-ft. level, 103 ft. in waste.

The official report of the Alaska Mexican Gold Mining Co., for month ended July 15, is as follows:

Mill time elapsed, 30 days; running time, full mill of 120 stamps, 28 days, 17 hr., 57 min.

Tons ore crushed, 18,307; tons concentrate saved, 360.

Estimated gross value of free gold	$35,054.13	
" " " " concentrate	35,131.03	$70,185.16
Less amount due United company		906.87
Estimated total production		$69,278.29
" " realizable value		$66,767.75
Operating expenses		26,946.33
Net operating profit		$39,821.42
Construction expenses, etc		6,974.72

Yield per ton of ore milled, $3.78; stock of broken ore increased 85 tons.

Development work, 508 ft.; 1100-ft. level, 169 ft. in waste; 1200-ft. level, 140 ft. in vein matter; average assay value, $2.27, 50 ft. in waste; 1320-ft. level, 149 ft. in vein matter; average assay value, $2.02.

ARIZONA

COCHISE COUNTY

Kirk L. Hart, manager for the Cochise Copper Co., operating at Johnson, has made arrangements for the resumption of work at the company's ground. At the present time the workings at the mine consist of a 550-ft. shaft with a number of drifts and cross-cuts to the ore. The intention of the management is to sink to the 1000-ft. level and develop the vein at that depth.——The shaft at the Centurion in the Dragoon district, has opened a body of ore at a depth of 410 ft., and a station will be cut at the 425-ft. mark and the vein prospected.

GILA COUNTY

(Special Correspondence).—Due to the fact that only one man can work at a time in the Blackbird shaft at the Arizona-Michigan property, the shaft is being driven alternately with the cross-cut at the 405-ft. mark. It is about 430 ft. deep, the formation being a shale that has obtained for the last 50 ft. Work is progressing at the rate of three feet per day. The cross-cut north to the Old Dominion vein has progressed about 15 ft. and is approximately 4 by 7 ft. in cross section. Both are being driven under contract, at a price of $8 per foot for the shaft and $5 per foot for the cross-cut.——The 14th churn-drill hole has been finished at the Live Oak property, at a depth of 375 ft., having shown a thickness of 120 ft. of ore. The 15th hole is 340 ft. deep and still in the oxide zone, where silicious ores are being cut. The 16th hole, at a depth of 280 ft. is also in the oxide zone. The 17th hole, at a depth of 115 ft., is in the unmineralized capping.——Work at the Warrior mine is continuing westward on the 300-ft. level. A drift is being driven along the foot-wall of the ore-bearing trough, and some time ago a cross-cut was run to cut the orebody. This was driven for 50 ft., and cut 20 ft. of vein matter, 6 ft. of which was high grade.

Globe, August 13.

MOHAVE COUNTY

(Special Correspondence).—S. C. Bagg and associates, have given a lease and bond on their Cyclopic group of claims in Gold Basin. The lessees have started a new shaft and have a promising gold showing.——The Golden Trail group, in the San Francisco district, has been acquired by a group of Utah capitalists.——An increased force of men is being employed at the La Garcia mine in the Black hills. Development will be advanced on a larger scale and the output of ore increased. Regular shipments will be made to the Humboldt smelter.

Kingman, August 15.

PINAL COUNTY

(Special Correspondence).—Ray Consolidated is now working 1200 men at the mine and mill. About 600 men are working underground and about 1000 tons of ore are being placed on the stock pile per day. Only six drills are operating on prospect work. Most of the steel work for the concentrating section of the mill at Winkleman is in place.——At the property of the Copper Creek Mining Co., about 30 miles southeast of Winkleman, work is being devoted to the completion of the tramway to Mammoth and the erection of a smelter. A 75-ton reverberatory furnace and a 75-ton water-jacketed rectangular matting furnace will be installed. Present plans also include the erection of a 150-ton converter plant. Part of this equipment has recently been laid down at Winkleman, and is now being hauled to the property. The furnace will be equipped to use crude oil and a boiler plant will be added to utilize the waste heat. Pending the completion of the smelter and some minor changes in the concentrator, work at the different mines of the company is not being rushed.

Ray, August 13.

YUMA COUNTY

B. F. Hall, of New York, has purchased the controlling interest in the old Desert mine, two miles north of Vicksburg, and will start the 10-stamp mill on the dump which contains enough ore to keep the plant busy for the next two years.

CALIFORNIA

CALAVERAS COUNTY

The mill at Sheep Ranch is only running two shifts owing to the lack of water, though the cyanide plant is to resume operations shortly.——Work has been suspended at the Washington mine, in the Indian Creek district, for a few days owing to a break in the compressor.

INYO COUNTY

The assessment work at the Copper Queen claims, in the Oasis district, has been completed and some high-grade copper ore opened. The Schwab property to the south of this group is working 18 men and opening a large deposit of copper ore.

KERN COUNTY

The Harris Reeves company, of Los Angeles, has commenced operations on the property of the Arondo Mining Co., of which W. H. Miller is manager. This mine, situated in the Argus range, was discovered and developed by Gilbert S. Dean, formerly half-owner of the Dean & Jones mine in the Slate range. The Arondo mine is equipped with Cornish rolls and a 50-ton cyanide plant and has been a steady producer for several years. During the past winter, which was usually severe, the six-mile pipe-line supplying water to the mill was frozen thereby crippling the production to

such an extent that [illegible] financially involved. The present work is being done with a view to solving the financial situation. Conway & Rinaldi have contracted to haul freight to the mine and have taken out an initial shipment of five tons of machinery and supplies.——The Sultana group, six miles south of Randsburg in the Stringer district, has completed a mining of about 50 tons of ore at the Phoenix mill near Johannesburg. This is the second shipment of ore made from the property during the present year. This mine was developed by D. V. A. Williams, and has produced several pockets of high grade ore. The workings extend to a depth of 300 ft. and the mine is equipped with a hoist and air drills. Albert Burcham is in charge.——The Merced milled 24 tons of ore which is said to have plated about $100 per ton.——Watchman brothers leasing on the 1000 ft. level of the Butte mine, recently cut a rich lens of ore, said to assay $200 per ton.

NEVADA COUNTY

(Special Correspondence.)—The Empire Gold Mining Co. is rapidly completing its cyanide plant in which two Oliver filters will be installed early in October.——The raise from the adit at the Jenny Lind is nearing the channel, and the management is hopeful of commencing early production. Joseph Bartell is superintendent.——The south drift from the 1100 ft. level of the Pittsburg has opened the shoot for a distance of 150 ft. Assays run over $10 per ton, and the grade is improving. Ten stamps are running steadily.——The 5 ft. vein on the 800 ft. level of the Champion is showing excellent ore, and the company is arranging for more extensive work from this point. It is possible that a new shaft, above the Providence mine, will be put down next year. Edward C. Uren has been appointed manager.——Arrangements are under way at the Erie mine for heavy production.——It is stated that the Los Angeles interests who recently took over the West Point and Mitchell mines, at Deadman Flat, will commence activites before the end of the month.——It is understood that the new operators of the Murchie are anxious to unwater the shaft, but are unable to secure power, because of lack of water.

Grass Valley, August 15.

Good progress is being made at the Cassidy, near Grass Valley, the shaft being down 155 ft., and progressing at the rate of 6 ft. per day. The shaft has run out of the vein but is expected to pick it up again within the next 50 ft. as the ore is pitching toward it.——A fire which started from the sparks from the engine in the 10-stamp mill at the Birchville mine, two miles from Graniteville, completely destroyed the plant, causing a loss of $40,000 and throwing about 100 men out of employment.

RIVERSIDE COUNTY

(Special Correspondence).—The Gold Park Consolidated Mines Co., operating 70 miles from Banning, on the Southern Pacific, has let a contract for the sinking of its shaft from the 170 to the 500-ft. level. A cross-cut at the 130-ft. level showed the vein to be 60 ft. wide. There are about 1400 tons of good-grade gold ore on the dump, and the showing in the workings is promising. This company is operating two claims, the Black Warrior and the White Warrior. Plans are being made for a small mill.——C. C. Porter, of Los Angeles, has taken a lease on a 7000 ton dump near Leastalk, and has installed cyanide equipment. The ore averages $5 per ton and a saving of 80% is being made.

Banning, August 15.

SAN BERNARDINO COUNTY

The Precious Metals Development Co., operating seventeen miles from Silver lake, is having trouble in its mill on account of a lack of water. The property is developed by a 770-ft. adit, 140-ft. shaft, and 85-ft. shaft, with over 2000 ft. of work in drifts and cross-cuts. About 100,000 cu. ft. of ore, of an average value of $30 per ton in gold, has been developed. The commercial ore varies between two and three feet in width. A cyanide plant is planned for the future.

SHASTA COUNTY

The Old Spanish mine six miles from Redding, on the old Shasta road has been taken over by James Sage and will be reopened.——The third furnace at the Mammoth mine at Kennett has been blown in and the bag house is successfully handling the smoke from the three furnaces.——Work at the Balaklala smelter at Coram is being advanced rapidly and it is hoped to have the Cottrell plant finished by October 1.

SIERRA COUNTY

Good progress is being made in reopening the old incline shaft on the North Fork placer, at Forest, to tap the Uncle Sam vein. The incline has been cleaned out and retimbered to a point 450 ft. from the portal.——The main working adit at the Omega is being driven steadily ahead and the deposit of gravel extensively opened. A number of breasts will be driven as soon as the fall rains furnish enough water to wash the gravel, when a force of 150 men will be employed.——Fitzgerald & Coglan are experiencing considerable delay in getting in their pipe line for the hydraulic power plant on the middle Yuba river, though the compressor has been ready for operation for some time. The owners of the property are figuring on a mill and it is probable that it will be installed this fall.——Fifteen tons of

mining machinery has been shipped to the Primrose mine in Hog canyon.——George E. Turpen has secured a bond on the Carson claims in Slug canyon. A small shaft has been sunk on the shoot and a little driving done on the vein which is east of the serpentine belt.

TUOLUMNE COUNTY

(Special Correspondence).—It is reported that a rich find was recently made in the Shawmut mine. Repair work is now in progress in the lower levels and until completed only 40 stamps of the big mill will be kept in operation.——A pipe-line is being laid to convey water to the Dutch and Sweeney mines.——Harry Shaw and Thomas Doyle have found encouraging prospects in their gravel mine situated one-half mile from Columbia, and are at present endeavoring to connect with an old adit for the purpose of draining the basin where the gold-bearing gravel lies. This has been attempted in former times by others, who abandoned the work on account of the large amount of water.——The Gold Ship Mining Co. is carrying on work at its gravel property in the Groveland district. The Corcoran Flat adit is being cleaned and will be driven to the north end of the claim. It is said that rich gravel was exposed

in this adit by the early-day miners who worked the property, but was left owing to the inadequate machinery then in use. The present company contemplates installing complete equipment in the near future, and will use electric power.

Tuolumne, August 12.

COLORADO

CHAFFEE COUNTY

The fourth shipment of gold from the Cache creek placers this season has been made. Ten thousand dollars in bullion was carried by three men, under heavy guard, from the works of the company to Granite, a distance of three miles, where it was shipped on the Rio Grande train to the mint at Denver. This makes the fourth shipment of the season of an aggregate value of $50,000. This is the placer which is believed to have received its rich gold deposits from the Lost Canyon mountain, upon whose peaks there are being opened some valuable gold leads. Several nuggets of various sizes have from time to time been found on this mountain, but so far the veins prospected have been small, but exceedingly rich.

CLEAR CREEK COUNTY

(Special Correspondence).—The Capital Mining & Tunnel Co., operating on Griffith mountain, has decided to grant a number of leases on the west drift of the Aetna vein. A number of applications have been received, the first block of ground having been alloted to H. Ratholz & Co. In the east drift on this vein a streak of ore 6 ft. wide is opened that mills 9 oz. gold per ton. N. M. Brady is manager.——Alkire & Co., leasing on the Bismark vein through the Hercules level, are shipping ore that mills 320 oz. in silver per ton.——R. Sartori, leasing on the same property, forwarded a shipment last Saturday that milled 514 oz. silver. A. Erickson, also operating under lease, sent down 8 tons that brought 290 oz. silver per ton.——The Temple electric-drill for the Reliance Gold Mining Co., arrived last week and has been taken to the seat of operations. A. W. Longhi is manager.——Excitement on Bard creek, at Camp Beshears, was stimulated owing to a discovery made at the Roepper property. In the bottom of a 10-ft. prospect hole a 7-in. streak of ore was found that contains free gold. Tests run as high as 17 oz. gold per ton. James Beshears is the owner.——The machinery for the Bard Creek Mining Co. arrived the latter part of last week. It will soon be ready to put in operation. F. Nelson is manager.——Report is current that Denver capitalists have taken a bond and lease upon the Virginia City mine. The option calls for $75,000, the first payment to fall due September 1. F. A. Maxwell is owner.——The Navarrio Mining & Tunnel Co. has been incorporated and work has been put under way in the driving of an adit that is to intersect at depth the entire vein system of Lincoln mountain. C. E. Smith, of Empire, is manager.——It is reported that the Ramsdell Gold Mining & Milling Co. has been thoroughly financed. The Market adit will be continued for some distance. G. W. Teagarden, of Denver, is manager.——The heading of the Homestake adit is still in vein matter. The lode being penetrated is the Golden Jack. A. L. Stephens is manager.

Georgetown, August 13.

GILPIN COUNTY

(Special Correspondence).—A local pool has taken a lease upon the Avon mill, and the machinery is being overhauled. The plant will be run upon ore from the San Juan vein, operated through the LaCrosse adit.——Production is again in order from the British mine in Lake district. The entire workings have been cleaned out and retimbered.——The shaft on the Argo mine has reached a depth of 330 ft. Before any driving is started it is proposed to sink to the 400-ft. level.——On the Gunnell mine Shinher & Co., of Black Hawk, have taken a lease on the Fagan vein. A streak of ore 3 ft. wide is being exposed on the 120-ft. level that is worth $12 per ton in gold.——Johns & Oliver, leasing on the Mitchell mine, have started work on a shaft-house, and will install machinery. Miners are at work in various parts of the property making ready for a steady production.

Central City, August 13.

OURAY COUNTY

The adit of the Wanakah Mining Co. opened a large vug 113 ft. from the surface on the Finance claim from which a large amount of carbonate ore assaying from $30 to $500 per ton is being taken.——Paul Walker and partners, opened a 5-in. streak of gray copper ore in a 2-ft. vein at their Kansas City group.

SUMMIT COUNTY

Preparations are being made at the Wellington mine, in the Breckenridge district, to sink a new 3-compartment shaft. Over 1400 tons of ore and concentrate were shipped from the recent mill-run.——Work has been resumed in the North America adit of the Mary Verna Mining Co., a contract for 1000 ft. of driving having been let. This will cut several well known veins and complete the adit which will then be 3700 ft. from the portal to the face.——A vein of high-grade ore has been opened by Dan Dean on his claims at the head of Illinois gulch.

TELLER COUNTY

The Banner property on Beacon hill, situated below the El Paso has been started by the Union Leasing Co., holding a long time lease. A complete new plant has been installed, consisting of hoist and boilers and an electric compressor. The present depth of the Banner shaft is 375 ft. and it will be sunk 200 ft. Besides this work, the leasing company will drive several cross-cuts in going down.——On the Half Moon claim on Gold hill, H. P. Reiton, the lessee, is driving south on the first level for a junction of two known veins. One of the veins has been opened on surface, while the other vein is open on the same level. The cross-cut has been run 45 ft. and according to engineer's measurements the junction should be close. One of the veins crosses from the Geneva claim.——Andrew Larson and W. Anderson, operating the Brooklyn claim, blocks 230 and 237 of the Stratton estate, shipped two cars of ore. This was mined at 25-ft. depth working in the old Reiton shaft. The body is 6 ft. wide and averages three ounces. This vein lies next to the Eagles dike, which runs from Altman down through the Eagles and thence south. At places on this dike where stringers and veins cross it, rich ore has been found.——The re-timbering of the Granite shaft, or the Coin shaft, as it is better known, will be completed about September 1, if present progress is kept up, and the work is continued without trouble. The vein, known as the McCarthy vein, opened in the upper Granite, has been found in the deep levels working through the Coin shaft. This vein has netted more than $1,000,000 to the owners of the Granite company. It is 4 ft. wide and is rich.——The quarterly report of the Doctor-Jack Pot Mining Co. has been received by stockholders, and on the whole shows the condition of the company to be very good. There are 16 sets of lessees working on the property, the majority shipping ore. During the last quarter 2100 tons of ore was sent out, the average value estimated at more than an ounce.——Frank Seeley, lessee on the Nighthawk property on Bull hill, one of the Stratton estate properties, has installed a plant of machinery, consisting of a hoist and boiler, and shipments from the mine will begin immediately.

IDAHO

SHOSHONE COUNTY

(Special Correspondence).—The Caledonia Mining Co., operating at Wardner, is shipping about 800 tons of ore per month, which is divided between the American Smelting & Refining Co. smelters at Tacoma, East Helena, and Colorado. The bulk of it averages 75 oz. silver, 15% lead, and 2 or 3% copper; part of it, however, has sampled 45 to 48% lead, and 65 to 75 oz. silver. Charles McKinnis, the manager, states that work has commenced on a 2800-ft. cross-cut that is intended to strike the orebody 660 ft. below the lowest workings. An electric-driven air-compressor has been installed in Deadwood gulch, where the adit begins. When this work is finished it will be unneces-

[illegible] hoist the ore and the present 2" mine hard to keep [illegible] will be stopped as the adit will have railroad connection. E. D. Booth is foreman at the mine.

Mining companies operating in northern Idaho have suffered severe losses by forest fires the last 60 days. The Western Pine Manufacturers Association and the North western Forestry and Conservation Association have urged the President and the Secretary of War to send Federal troops into the national forest reservations to fight fires. Near Murray, an area of 10 square miles of timber land has been devastated by fires which also destroyed buildings, flumes, and appliances owned by mining companies. Employees of the Orofino, Black Horse, Paragon, Monarch Giant, and Allie mines, under Mr. Williams, Forest Ranger, from the Eagle sawmill, fought the flames for a week, while a force of 20 men from Murray fought the fire at Butte creek and succeeded in turning it. It is now within eight miles of Murray. Veteran prospectors in northern Idaho say that no fire of equal destructiveness has swept over the Shoshone district since 1864, when Federal Government employees, engaged in building a wagon road and forts, started a blaze to drive the Indians and wild animals out of the territory. The fire got beyond control and laid waste many sections of timber land.

Wardner, August 12.

MISSOURI

NEWTON COUNTY

(Special Correspondence).—Potter & Buskett have opened a good deposit in the vicinity of Tipton Ford, southeast of Joplin, the lease lying near the famous old Gilt Edge property which produced wonderfully in the early days. The ores marketed here ran 62% zinc. The present developments were made by reopening an old tract which was worked to a limited extent in the early days and then abandoned, the lead only being mined while the zincblende was left untouched. There is as a consequence a large dump pile rich in blende which will be worked by the operators. The deposit is found at 70 ft. and the drifts so far run show a 20-ft. face. There have been five drill-holes put down blocking out the mineral.——In the Spring City camp, Arthur Scott has sunk a drill-hole on a lease east of the Delta, and is finding a very high grade of lead and zinc, apparently an extension of the find in the Delta where the lead mined has been the best in the camp. The hole entered the deposit at 168 ft. and continued through 8 ft. of rich cuttings, which ran 20%. The lease will be developed by other drill-holes before a shaft is sunk.——The U. G. Wilson company is sinking a shaft on the lease which will make the third one put down. Drill-holes near this showed a blanket formation of lead and zinc. A drift is being extended westward from shaft No. 2 into good ore. Sludge washers are cleaning ore from the refuse of the Wilson mill.——Still further to the south in the old Seneca camp, the Becker mines are producing on first-class ore running 60% zinc. The drifts have been driven recently underneath the former workings and the face has widened until it is now 20 ft. high and 40 ft. wide. Enough ore has been taken from the mine to pay all the expenses of operation to date.——The Granby camp has been extended by the finding of a good deposit some distance southeast of the old camp. The ore was found on the Spangle & Fischel land and occurred practically from the surface down to 50 ft. The shaft will be sunk to 100 feet.

Tiptonford, August 12.

MONTANA

LEWIS AND CLARK COUNTY

(Special Correspondence).—The Northwestern Metals Co., which purchased the site and buildings of the old Steadman foundry, at Helena, is remodeling and re-arranging the plant with the purpose of installing an electrolytic plant of 100 tons capacity, to treat refractory ores containing gold, silver, lead, zinc, and copper. The plant is to be operated under the Baker-Burwell patents. The equipment, which has been ordered, is intended to be installed and ready for work by February 1. It will consist of a crushing rods dryer, chloridizer and electrolytic cells. The process is to consist of crushing to 20-mesh, drying and chloridizing by dry chlorine gas to be produced electrolytically from salt solution. The chloridizing is to take place in a revolving tube mill, the pulp to pass thence to concrete leaching vats, and it is claimed the metals can be precipitated as refined metals. It is asserted that by thorough experimentation in a smaller mill of this kind successful work was performed and a high recovery of the metals was made. M. L. Hewett, A. W. Burwell and C. C. Titus are actively concerned in building the plant.

Helena, August 12.

NEVADA

ESMERALDA COUNTY

The junior class of the Mackay School of Mines, University of Nevada, completed at Goldfield its summer school work in mine surveying and mining field geology. The surveying consisted in triangulation, linear and topographical surveys, the running of levels, solar and Polaris observations for meridian. Underground, four levels were surveyed and the main shaft of the Red Top mine was plumbed. Three patented mining claims were 'tied in,' and missing corners reset according to patent survey description. The surveying was in charge of H. P. Boardman. The field geology consisted in mapping approximately 18 square miles in the vicinity of Goldfield, a plane table survey of a mining claim on Columbia mountain, the mapping of the underground geology, and the preparation of structure sections of the Red Top mine. The geological work was in charge of J. C. Jones. The students were encamped in the field eight weeks.——The period of comparative inactivity that has characterized the Florence operations is apparently at an end and extensive development will now be undertaken in the lower levels of the mine.——The new station at the 540 ft. level of the Cherokee lease on the Atlanta ground has been completed and development will be advanced from that point.

HUMBOLDT COUNTY

(Special Correspondence).—The output of the National Mining Co. for July, amounted to $280,000. The new mill has been practically completed and will commence production with the completion of the tramway from the mines to the plant. On the Stall lease the shaft is down 400 ft. and is being sent deeper. The small mill is running on bonanza ore, the lower grade being stored for future treatment. The ore in the bottom of the shaft is excellent.——The English capitalists owning the Darby mill at Mazuma, and the Florence lease near Vernon, have acquired the Big Bug claims, adjoining the Mammoth, at Farrell. Development will commence immediately. M. Gillespie is manager.——The Garwood lease is arranging to commence activities on the Faywood-National property. A long adit will be driven to open the veins disclosed in surface workings. James Ritchie is superintendent.——The Gold Note Consolidated Mining & Milling Co. has been formed by New Yorkers to acquire the principal mines in the old camp of Kennedy, 60 miles from Winnemucca. The holdings comprise 1600 acres of mineral lands, together with a 20-stamp mill, and a small Huntington plant. It is planned to work the properties principally by the leasing system. Paul Klopstock is manager.——Throughout the National and Seven Troughs districts mining is active and many of the properties are showing exceptionally well.

Winnemucca, August 12.

WHITE PINE COUNTY

The first of the two new steam shovels of the Nevada Consolidated Mining Co., for the new Liberty pit, has arrived, and been placed in operation at the mine.——The cross-cut from the Eureka shaft of the Ely Central is out over 100 ft. while the shaft itself is nearing the 600-ft. point from which another cross-cut will be started.——At the Giroux the only exploratory work at present is that carried on by the three churn-drills, but the management is preparing to further develop the Alpha orebody at an early date.——The ore-bins for the new mill of the Amal-

gamated Mines Co., near Osceola, are in position and the heavier timbers for the upper portion of the plant have been installed. The work of constructing the plant is under the supervision of R. L. Coulthard, millwright for the Traylor Engineering Co., which has the contract for the erection of the mill.

UTAH

JUAB COUNTY

What is believed to be the same body of ore from which the Colorado has been shipping for years, has been cut in the drift on the 350-ft. level 30 ft. below the rich orebody. The ore was found 350 ft. from the endline of the Sioux Consolidated which has the ore at a depth of 450 ft. ——Suit has been filed in the district court by the Beck Tunnel Mining Co., against the Uncle Sam Consolidated Mining Co. The plaintiff secured a temporary injunction. It asks for $300,000 damages for ore alleged to have been taken from the Cyrus Oliver claim adjoining the Humbug.

SALT LAKE COUNTY

The Reeds Peak Mining Co. is working six men at its property in the big Cottonwood district.——The Carbonate Mining Co. is completing its tramway which will carry the ore for shipment to the smelter.——At the Cardiff 125 tons of ore per month, which assays $50 to $60 per ton, is being shipped. The company is building new houses for the accommodation of the men and adding to the force working on development.——Recent work at the Baby McKee has opened an 8-in. vein that assays $50 per ton.——The Neva Mining Co. has opened a vein that assays 30 to 40 oz. silver with 40% lead and a small amount of gold.

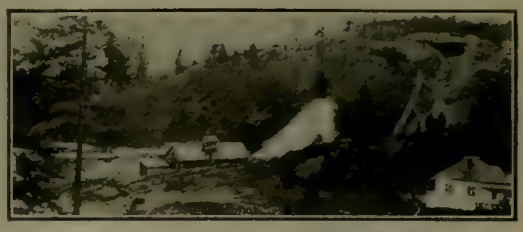
WASHINGTON

FERRY COUNTY

The Pearl Consolidated company paid its fifth dividend on August 11. It amounted to $19,707.11, or one cent a share. This brings the total of dividends to date by this company to $108,389.05. The company is owner of the Lone Pine-Pearl-Surprise group in Republic camp, for the last seven months operated by the Republic Mines Corporation, J. L. Harper general manager. Its earnings are from a 50% royalty on all shipments made by the Republic Mines Corporation and are being applied in the form of dividends to a liquidation of its capital stock. The lease and bond are for $225,000, of which, as evidenced by the dividends, half has been paid. The lease still has 18 months to run. The Republic Mines Corporation began the payment of regular monthly dividends from the profits of its lease two months ago. These now total $25,000, and $15,000 was paid a few days ago. This will bring the total earnings of the Surprise mine, which will have been distributed to the shareholders in less than six months, to nearly $150,000.——The British Columbia Copper Co., of Greenwood, is shipping iron-copper ore regularly from its Napoleon mine near Boyd.

STEVENS COUNTY

(Special Correspondence).—The First Thought mine is situated on the east side of the Kettle river, three miles northeast from Orient, which is on the Great Northern railroad. This mine has been producing ore during the past five years, and belongs to P. Burns & Co., of Calgary, B. C. The property is managed by Alexander Sharp, who employs thirty men, and ships approximately fifty tons of ore per day to the smelting plant at Trail. The ore occurs in an andesite formation, the mineralized body not being limited within defined walls in all places. The analysis of the ore is given as follows: Gold, 1 oz.; silver, 1 oz. per ton; iron, 8%; lime, 10; sulphur, 3; silica, 70; and alumina, 14%. The ore is hauled through a 700-ft. adit, which opens the orebody at a depth of several hundred feet below the apex of the vein. Much of the orebody above the adit-level has been stoped out. A 150-ft. winze has been sunk on the ore from the main level, and a good part of the tonnage being mined is taken from drifts off this winze. Stoped-out chambers off the main adit, and extending 50 to 100 ft. below it, have proved a mineralized body 60 to 80 ft. wide. The ore is transported from the mine to the bunkers at the railroad over a two-mile aerial tramway.——The Swamp King M. Co. is developing a gold property three miles north of the First Thought. This belongs to L. D. W. Shelton, who has bonded it to the Swamp King company, made up of R. M. McIntire and associates. The company has installed a steam-hoist and blower, and has sunk an 80-ft. shaft since March 1. The ore comprises copper-iron sulphide containing gold. In fact, some of the best ore contains sylvanite. Mr. McIntire has a considerable tonnage of iron ore on the dump, and will make a shipment to one of the smelters.——The Kettle River M. Co., situated on



First Thought Mine.

the east side of the Kettle river, opposite Rock Cut, will soon have its concentrating mill ready to operate on galena ore.——The First Thought Extension, which has the same kind of ore as the First Thought, has half a dozen men at work.——J. T. Dolan has been developing for several years his Second Thought group of claims lying south of the First Thought.

Orient, August 13.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—A campaign of diamond drilling is planned for the City of Paris mine at Central. This property has been idle for many years, but is receiving renewed attention, as the No. 7 property is working and a new road has been built to Central.——In Phoenix, during the past week, the regular shipments were made to the Granby and B. C. copper smelters, and from the Snowshoe to the Trail smelter.——The new slime-treating mill at the Jewel mine is in operation. The average ore of the Jewel mine assays $15 per ton. It contains galena, zincblende, iron pyrite, and occasionally ruby silver, telluride, and some free gold, and has proved difficult of treatment. It is thought the new 15-stamp mill with the Nichols process will meet with success.——Water has been turned into the new pipe-line of the Daly Reduction Co., at Hedley. This line will be an auxiliary to the big flume and will supply water for the batteries, boilers, vanners, and cyanide tanks. There are 150 men employed about the Nickel Plate properties, and the new plant, including the Doble wheel, engine, boilers, and tube-mill, is all in and will soon be working.

Rossland, August 13.

MEXICO

CHIHUAHUA

L. T. Bryant is to equip his San Pablo gold-silver-lead mine at San Pedro with machinery for deeper development. The San Pablo adjoins the Congreso mine of the Candelaria Mining Co. and is believed to have the continuation of the Congreso's orebodies. The San Pablo shaft will be 400 yd. from the terminus of the new railroad being built by the Candelaria company to the Congreso mine from the Mexican Northwestern railroad.

GUERRERO

It is reported that the American Smelting & Mining Co. will establish an ore-buying agency at Taxco, and will handle the ore at the patio of the mine.

SONORA

The plant of the Yaqui Smelting & Refining Co. at Toledo, Ures district, 150 kilometres north of Corral, on the Corral branch of the Mexican Southern Pacific railroad, after being shut down for three years, owing to high cost of fuel, is being put in order, as the company expects to blow-in the smelter before the rainy season begins. Ore is being shipped to the plant.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS

RELOCATION OF MINING CLAIM—CONFLICTING CLAIMS

The statute of Wyoming provided that if a locator believes the original location certificate to be defective he may file an additional certificate not infringing the rights of others existing at the time of such relocation and that such relocation will not preclude the claimant from proving the title under the previous location. Accordingly where a valid discovery of a claim was made in 1897, the boundary stated the development work done and the original location certificate was recorded within the time and in January 1907 the original locators or their assigns filed an amended certificate describing the claim as originally located, and which recited that the amendment was filed without waiver of any previous rights, but to correct errors in the original location, such original location and such relocation gave a prior and superior right to the claim as against a rival claimant who had posted notices and commenced work on a discovery shaft at the time the certificate of relocation was recorded, but where the certificate of the rival claimant was not filed until at least five weeks after the filing of the amended certificate by the original locator or his assigns. The rule is that where the original discoverers and locators have sunk a shaft and each one knows of the existence of mineral-bearing rock in place in such shaft and at the point where the notice was posted, such facts sufficiently show a discovery to support a new location by them at the time of posting the notice. And where a mining claim is relocated by the original locators the boundaries of the new location need not be marked, as required by the statute for an original location, in case the boundaries of the original location are marked and identified, as a locator may adopt the original markings and the boundaries where the exact ground is embraced in both locations and where the boundary posts of the original location still remain, notwithstanding the statute contains an express permission to adopt old boundaries only in case of an abandoned claim. It is also the rule that if a new location of a mining claim by a person holding under a former location is for any reason invalid, the attempted relocation is not an abandoned one or a forfeiture of the former location; and it follows that a deed to a mining claim describing the premises as recorded in the records of a certain named county will pass the interests of the grantors not only under the certificate of the original location as recorded, but also the interest of the grantors in the same claim under a subsequent location. It is also the rule that where location certificates have been on record for several years prior to an attempted location of adverse claims, they take the place of the location notices and render proof of the posting of such notice unnecessary as against any such adverse claimants.

Bergquist *v.* W. Virginia-Wyoming Copper Co., (Wyo.) 106 Pac., 673, Feb. '10.

PROTECTION BY RE-LOCATION

Where a mining claim has been improved by the original locators or their assigns without abandonment, but because of a defect in their original location certificate, the former locators or their assigns have the right to protect their interest by making a new location, if there has been no failure on their part to perform the required development work. So where a corporation acquired all the title of the original locators of a mining claim both under an original and subsequent location it was competent and proper for such corporation to record an additional or amended certificate of location and claim thereby the discovery as of the date of the discovery by the original locators. In such case it is proper to prove that the original locators in re-locating a claim adopted the boundary stakes of the original location.

Bergquist *v.* W. Virginia-Wyoming Copper Co., (Wyo.) 106 Pac. 673, Feb. '10.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

A. H. HELSER is at Greyhound, Idaho.

HERBERT L. EATON is at Liberty, Missouri.

R. P. MCLAUGHLIN has been in San Francisco.

C. S. VERRILL is at Vancouver, British Columbia.

EZEQUIEL ORDONEZ has gone to Stockholm, Sweden.

N. W. CHAPMAN, of Redbov, Oregon, is in Chicago.

EDGAR RICKARD has been enjoying a vacation in France.

E. M. STEWART has left Ray, Arizona, for Lang, California.

HOWARD D. SMITH has returned to San Francisco from London.

JOHN B. FARISH, who has been in San Francisco, has gone to Nevada.

J. C. PICKERING is with the Mexico Mines of El Oro, El Oro, Mexico.

S. W. LAUGHLIN, formerly of Golden, Colorado, is now at Butte, Montana.

H. S. WASHINGTON will leave New York soon for another stay in Brazil.

THOMAS T. READ married MARY CARLTON PECK at Peitaiho, China, July 26.

WILLIAM P. MILLER, JR., has removed from Los Angeles to San Francisco.

H. H. HOLBERT has left Fruita, Colorado, and is now at Gallup, New Mexico.

R. B. PARKE has been transferred from Olongapo, P. I., to Pearl Harbor, Hawaii.

R. P. WHEELOCK has gone from Searchlight, Nevada, to Battle Creek, Michigan.

JAY JEFFRIES is superintendent for the Ideal Mining Co. at Custer, South Dakota.

W. H. WEED was in San Francisco last week on his way to the Yellowstone Park.

A. H. ELFTMAN has returned from Minneapolis and the East and was in San Francisco.

FOREST J. SWEARS is making examinations in the Midway oilfields for San Francisco companies.

R. B. LAMB and B. BINNARD have returned from Los Angeles to New York by way of San Francisco.

MASON T. ADAMS has removed his office from the McPhee building to the Symes building, Denver, Colorado.

E. A. PRENTIS, JR., of New York, is now with the Lluvia de Oro mine, at Lluvia de Oro, Chihuahua, Mexico.

LEONARD SAYER, of Los Angeles, has recently examined mines in the Providence range of southern California.

L. S. ROPES and ROBERT MCINTIRE have opened an office at Helena, Montana, to engage in mining engineering.

G. G. ROCKWELL has returned from Cuba and is at Ishpeming, Michigan, with the Cleveland Cliffs Iron Company.

J. D. HUBBARD has gone East. His address until September 1 will be, care Oriental Con. M. Co., 15 Broad street, New York.

HOWLAND BANCROFT has completed his examination of the Deertrail mining district, Stevens county, Washington, and will be at Denver until September 15.

IVAN E. GOODNER has left the Bogardus Testing Laboratories at Seattle to take a position in the cyaniding plant of the Alaska Treadwell Gold Mining Company.

MONCRIEFF FINLAYSON, of the Royal School of Mines, will leave London in September to examine oilfields in Burma. His address will be care Steel Bros. & Co., Rangoon.

CURTIS H. LINDLEY, JOHN HAYS HAMMOND, JAMES DOUGLAS, J. PARKE CHANNING, H. FOSTER BAIN, W. R. INGALLS, E. W. PARKER, J. A. HOLMES, and GEORGE S. RICE have been appointed by the President as national delegates to the American Mining Congress at Los Angeles, September 26 to October 1.

Recent Publications

BIBLIOGRAPHY OF NORTH CAROLINA GEOLOGY, MINERALOGY, AND GEOGRAPHY, WITH A LIST OF MAPS. By F. B. Laney and K. H. Wood. Bull. 18, North Carolina Geological and Economic Survey. J. H. Pratt, director. Pp. 428, index. Raleigh, 1910.

COAL FIELDS IN COLORADO AND NEW MEXICO. By G. C. Martin, C. W. Washburne, M. I. Goldman, G. B. Richardson, and J. H. Gardner. U. S. Geol. Surv. Bull. 331-C. Contributions to Economic Geology, 1908. Pp. 181, Ill. Washington, 1910.

SIXTH ANNUAL REPORT, DIRECTOR OF SCIENCE DIVISION. NEW YORK STATE MUSEUM. By J. M. Clarke, director, and other contributors. Pp. 229, Ill., index. Albany, 1910. This report includes that of the State Paleontologist and several short geological papers.

COAL FIELDS OF WYOMING. By R. W. Stone, C. T. Lupton, H. S. Gale, C. H. Wegemann, E. G. Woodruff, M. W. Ball, Eugene Stebinger, and A. R. Schultz. U. S. Geol. Surv. Bull. 381-B. Contributions to Economic Geology, 1908. Pp. 186, Ill. Washington, 1910.

GEOGRAPHY OF THE MIDDLE ILLINOIS VALLEY. By Harlan H. Barrows. Illinois State Geol. Surv. Bull. 15. Pp. 128, Ill., index. Urbana, 1910. In this report Mr. Barrows has shown most effectively the influence of geography and geology on the settlement and industries of the area discussed.

DRAINAGE PROBLEMS IN TENNESSEE.. By Geo. H. Ashley. Bull. 3, State Geol. Surv., Tennessee. Pp. 74. Nashville, 1910. This is the first of the regular bulletins of the new Survey and includes a preliminary report on certain overflowed lands, written by A. E. Morgan and S. H. McCrory, with a copy of the drainage law of Tennessee.

ORE DEPOSITS OF NEW MEXICO. By Waldemar Lindgren, Louis C. Graton, and Charles H. Gordon. U. S. Geol. Surv. Professional Paper 68. Pp. 361, Ill., index. Washington, 1910. This work is the best general summary of the ore deposits of the region yet printed. It is profusely illustrated and contains a large amount of valuable information.

STRUCTURAL MATERIALS. By E. F. Burchard, A. H. Purdue, J. A. Udden, T. N. Dale, J. H. Gardner, N. H. Darton, E. W. Shaw, W. C. Alden, E. C. Harder, and F. L. Hess. U. S. Geol. Surv. Bull 430-F. Contributions to Economic Geology for 1909. Pp. 148. Washington, 1910. Among the especially interesting papers in this report are an account of the oolitic limestones at Bedford, Indiana, by Mr. Udden, and a paper on the slates of Arkansas by Mr. Purdue.

MINING LAWS OF AUSTRALIA AND NEW ZEALAND. By A. C. Veach. Pp. 180. Washington, 1910. When in connection with the conservation movement the question of revision of the public land laws of the West arose, it was promptly apparent that there was nowhere available adequate data regarding the form and results of various land laws tried out in Australia and New Zealand. Mr. Veach was therefore sent to those countries as a special commissioner to study and report upon their mining and land laws. It is a striking commentary upon the unbusinesslike manner in which appropriations are allotted at Washington, that funds were neither available for the expenses of the trip nor for the publication of the report. Apparently it was considered better to blunder along in the dark and re-try old experiments than to spend money in travel and study. However, the Director of the Geological Survey and Mr. Veach divided between them the expenses of the investigation and a limited number of copies of the report have finally been published as an appendix to the hearings of the Congressional Committee that has been investigating the Department of the Interior and the Bureau of Forestry. It happens in this, as in other cases, that the appendix is more valuable than much of the main report, and if the Investigating Committee has been properly impressed with the work and the circumstances under which it was done, one of their sessions, at least, was well spent.

Market Reports

LOCAL METAL PRICES.

San Francisco, August 18.

Antimony	12—12¾c	Quicksilver (flask)	$46½—47
Electrolytic Copper	14½—15¼c	Spelter	7—7¾c
Pig Lead	4.70—5.65c	Tin	35¼—36¾c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Aug. 11	12.44	4.40	5.05	53
" 12	12.44	4.40	5.08	53⅛
" 13	12.44	4.40	5.11	53¼
" 14	Sunday.	No market.		
" 15	12.56	4.40	5.13	53¼
" 16	12.56	4.40	5.13	53⅛
" 17	12.56	4.40	5.13	53

COPPER SHARES—BOSTON.

	Closing prices, Aug. 18.		Closing prices, Aug. 18.
Adventure	6	Mohawk	50
Allouez	42¾	North Butte	29½
Atlantic	6½	Old Dominion	37½
Calumet & Arizona	63	Osceola	130
Calumet & Hecla	545	Parrot	14½
Centennial	18	Santa Fe	1⅝
Copper Range	66½	Shannon	10⅝
Daly West	6¼	Superior & Pittsburg	11¾
Franklin	11⅛	Tamarack	59
Granby	35½	Trinity	6⅛
Greene-Cananea, ctf	7⅝	Utah Con	24¼
Isle-Royale	18	Victoria	3
La Salle	10¾	Winona	8⅛
Mass Copper	7½	Wolverine	124

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, August 18.

Atlanta	$ 16	Mayflower	$ 4
Belmont	4.05	Midway	
Booth	14	Montana Tonopah	89
Columbia Mtn	8	Nevada Hills	2.40
Combination Fraction	50	Pittsburg Silver Peak	50
Daisy	6	Rawhide Coalition	15
Fairview Eagle	40	Rawhide Queen	26
Florence	2.40	Round Mountain	45
Goldfield Con	8.47	Sandstorm	1
Gold Kewenas	8	Silver Pick	9
Great Bend	4	St. Ives	20
Jim Butler	26	Tonopah Extension	91
Jumbo Extension	63	Tonopah of Nevada	8.25
MacNamara	30	West End	64

(By courtesy of San Francisco Stock Exchange.)

The Prospector

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

V. V. S., Baker City, Oregon: Pyrite; the color is due to oxidation.

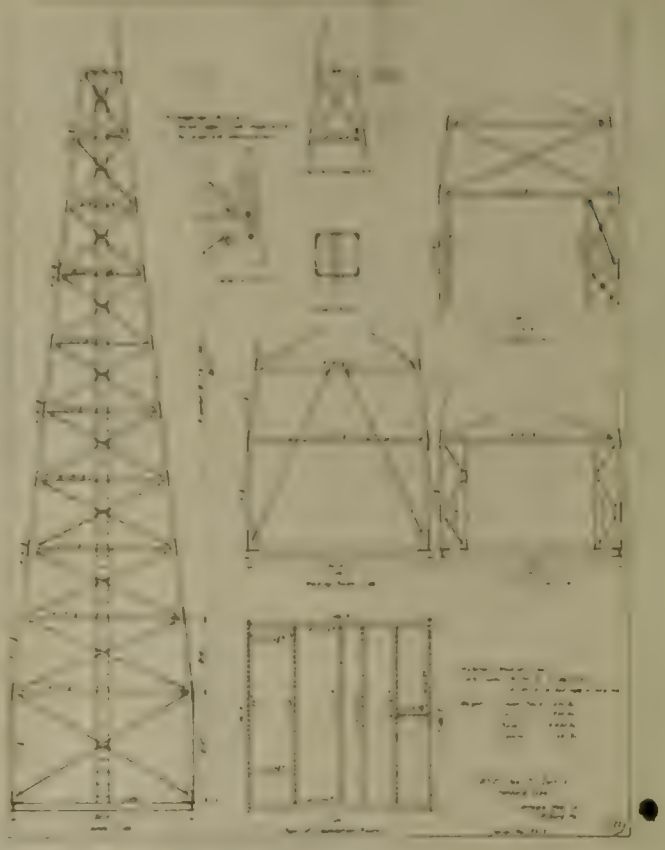
J. G. McP., Hillsboro, New Mexico: No. 1, common brown garnet; No. 2, specular iron, contains neither tin nor tungsten, may contain gold.

F. E. B., Goldfield, Nevada: No. 1, a highly altered acidic eruptive, probably rhyolite; No. 2, a basic eruptive so far altered as to render its original condition obscure.

W. F. C., Battle Mountain, Nevada: This extremely interesting and unusual ore specimen appears to be a breccia in which the outer portions of the larger fragments have been softened and rounded by mineral solutions and the original material replaced by quartz and calcite. In physical appearance it resembles what is commonly known as the 'orbicular' structure sometimes seen in diorite, granite, and some other crystalline rocks.

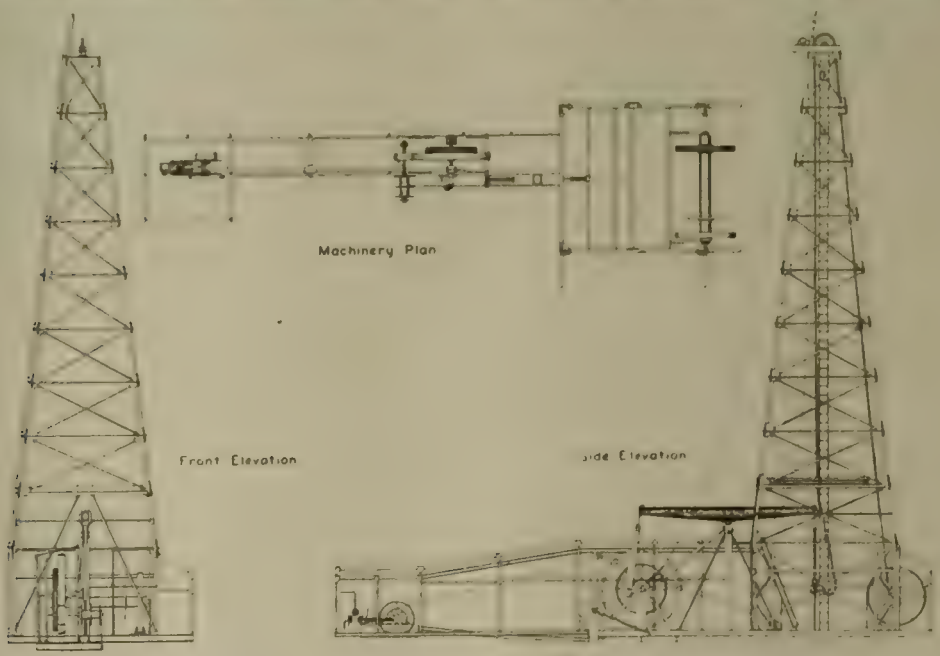
STEEL DERRICKS AND DRILLING MACHINES

Deterioration in the character of the timber available for derrick construction, the increase in cost and the lack of desired qualities have seriously interfered with its adaptation to present day conditions. In this which with improvements in tools and machinery the art of deep well drilling has been established more nearly on a scientific basis and there is recognition of the fact that a wooden construction is not adapted to removal and re-use and therefore is not economical on a basis of ultimate expenditure. The Carnegie Steel Co., of Pittsburg, Pa., has published a pamphlet pointing out the advantages of steel for the construction of derricks and drilling machines for deep well drilling, and describing certain types. Two types of derricks, the Standard and the Oklahoma, are made. An 80-ft. Standard derrick is illustrated in the accompanying cuts.



The first metal oil derricks were probably constructed of second-hand steel or iron tubing used in drilling operations, with forged connections and diagonal bracing made of rods and turn buckles or wire cables, which rendered them advantageous for use in spite of the cost of the blacksmith work necessary. The first derricks built of structural steel shapes, such as are used in buildings and bridges, were constructed on principles of design customary in the manufacture of viaduct, water, and transmission towers with long panels which necessitated the use of scaffolding or gin poles in erection. These did not conform to the type of derrick which is customary in wood and at first did not meet with favor from the drillers. Twelve such derricks were built by the Carnegie Steel Co. for the South Penn Oil Co. and the Carnegie Natural Gas Co. in 1903, for use in the Pennsylvania and West Virginia oilfields. They were 80 ft. high with a 20-ft. base, and provision was made at the top for crown pulleys and at the bottom for wooden bull-wheel supports. They weighed 24,000 lb. apiece and proved to be thoroughly satisfactory after erection, were stiff and steady under strain, and have been removed from their original location and re-erected more than once. Since then new and improved types, such as the one illustrated, have been designed.

The improvements incorporated in these derricks include the reduction of the height of the panels to permit erection without any special equipment in the way of scaffolding and to facilitate the removal of the derrick from place. Complete drilling machines as well as derricks are also now made of steel. In 1907 the first of these were made, being modeled after the regular 72 ft. California type, and since 1908 they have been regularly manufactured.



A NEW METHOD OF AGITATING PULP IN CYANIDATION

By John M. Nicol.

Mechanical methods of agitating pulp during leaching with cyanide solutions are being discarded in almost all the great mining centres, because of mechanical difficulties, lack of thorough mixing and effective aeration during the process, and especially of high power consumption. Compressed-air agitation has been widely adopted but also labors under serious disadvantages, due to incomplete mixing, the introduction of atomized oil from the compressor (which causes foaming), together with excessive aeration and attendant losses of cyanide from the last two causes. Experiments carried on by W. C. Paterson with a view to overcoming these difficulties demonstrated the possibilities and advantages of hydraulic methods of agitation, and after numerous tests and experiments by Mr. Paterson, E. E. Burlingame of Denver and other co-workers, an agitator has been evolved based on the principle of a hydraulic ejector. The latest model of this agitator is now being placed on the market by the Hydraulic Cyanide Agitation Co., of Warren, Pa., which controls the United States, Canadian, and Mexican patents.

The agitator consists of a conical-bottom tank similar to those used for air agitation, and fitted with a central circulating tube, which takes the place of the air-lift in the air agitators. The tank is also equipped with an inner annular baffle, which provides a calm zone between the baffle and the tank where no agitation takes place. Comparatively clear solution rises to the top from this annular space. A small amount of this clear solution is drawn off continuously through a flexible decanting pipe and supplies the suction of a small centrifugal pump. This delivers the solution under pressure to a nozzle at the base of the central lift tube. By this means all of the sand and slime is kept in constant agitation, without passing any sand through the pump. Immediately over the discharge of the central lift, a damper and distributer are provided which cause the ascending pulp to be distributed in a radial sheet, which assures a moderate and even aeration. In case additional aeration is required, a small stand pipe is attached to the suction of the pump, and equipped with a valve. By opening this, any requisite amount of additional air can be drawn in by the pump and brought in contact with the pulp during its passage through the central tube. The tanks are fitted with central discharge valves and are equipped for either intermittent or continuous process systems of agitation. The great advantages of the system are: (1) Low first cost, small centrifugal pumps being cheaper than air-compressors, and simpler to operate. (2) Economy in power, it being the lowest in power consumption of all systems of agitation. (3) Lower consumption of cyanide, due to the avoidance of excessive aeration. (4) Absence of 'foaming' which is such a serious trouble in air-lift agitators. (5) The apparatus will permit agitation of almost any range of pulp density or size of sand. (6) The current will start after settling for a number of days. (7) Perfect cross-agitation is provided which will distribute the sand evenly over the whole cross-section of the settling area.

Tests recently made on a working scale have shown the agitation to be nearly perfect, the extraction being as high as 94% in from 12 to 16 hours on gold ores, and from 83 to 90% on silver ores in 20 hours and under. Extensive tests are now being carried on in London and at the Rand, with a view to the erection of a large plant in South Africa.

CATALOGUES RECEIVED

The J. Geo. Leyner Engineering Works Co., Littleton, Colo. Bulletin No. 1017. 'Water Leyner Drills.' Illustrated. 16 pages. 6 by 9 inches.

Taylor Iron & Steel Co., High Bridge, New Jersey. Bulletin 108. 'Tisco Manganese Steel Mine and Skip Car Wheels'. Illustrated. 16 pages. 6 by 9¼ inches.

COMMERCIAL PARAGRAPHS

Edwin Letts Oliver, formerly metallurgist at the North Star mine, Grass Valley, California, has organized the Oliver Continuous Filter Co., with offices at 9 First street, San Francisco, and will devote all his time to the manufacture and sale of the filter invented by him.

The Galligher Machinery Co., Salt Lake, advises that sales of Callow screens for the month of July included the following orders: 12 duplex Callow screens for the Miami Copper Co., Globe, Arizona; 5 duplex Callow screens for the Real del Monte y Pachuca, Pachuca, Mexico; 3 duplex Callow screens for R. E. Briggs & Co., Mexico City.

One of the recent orders received by Allis-Chalmers Co. was from the Finnish American Copper Company at Helsingfors, Finland. This order was for a complete 'fine' concentrating plant for the extraction of copper, lead, and zinc. There was also included the complete power equipment, made up of boilers, engines, generators, and everything necessary for the entire plant.

The Edgar Allen American Steel Co., recently organized in Chicago, has purchased the Chicago Heights works of the American Brake Shoe & Foundry Co. and the New Castle, Delaware, plant of the Tropenas Steel Co., and after this date the manganese steel business of both the above mentioned companies, also the manganese steel business heretofore conducted in the United States of America by Edgar Allen & Co., Ltd., Imperial Steel Works, Sheffield, England, will be carried on by the newly formed company.

An interesting shipment of mining machinery was made August 3 on the steamer *Hellig Olav* of the Scandinavian American Line by the Ruggles-Coles Engineering Co. of New York. It consisted of two dryers of its class 'A' type, 104-in. diam., 45 ft. long, weighing 115,000 lb. They are to be used in drying magnetic iron concentrates and have a capacity of 35 tons per hour each. These dryers were purchased by Aktieselskabet Sydvaranger, of Christiania, to be erected at its plant at Varanger Fjord, Norway, 600 miles inside of the Arctic Circle.

The Eureka Stone & Ore Crusher Co., Cedar Rapids, Iowa, has recently put a new crusher on the market known as the Mitchell-Eureka. It is of all steel construction. The base is a single open-hearth casting which gives the necessary rigidity and strength. It is reinforced to stand the hardest shocks. The jaw plates are of the best grade of manganese steel. The eccentric shaft, which carries the weight of the pitman, is turned from open-hearth hand-forged steel. By turning a hand wheel the jaws can be opened and closed at will. The toggle plate prevents possible breakage from the accidental dropping of a hammer between the jaw plates. A method is provided for taking up the wear in the bearings. It is claimed that the machine saves 35% in power required by other crushers of like capacity. The bearings are only three in number and are equipped with ring oilers and compression oil cups.

The D. D. Demarest Co., San Francisco, advises that the following are among its recent shipments of mining and milling machinery: One 75-ton silver-lead concentrating plant, Nevada; battery timbers for 60 stamps, Mexico; 5-stamp gold mill complete, Tuolumne county, California; tramway machinery, Vulture mines, Arizona; 150-hp. double-drum electric hoist, Angels Camp, California; 700 cu. ft. air-compressor, Angels Camp, California; two 5-ft. 'Forwood Down' grinding pans, Nevada; Pacific stamp-stem guides, a number of orders to Mexico, four orders to Colorado, miscellaneous shipments to California mines; Cornish pumps, one 4-in. Neilsen pump, Dolly Varden mine; one 3-in. Neilsen pump, Nevada; two 8-in. Cornish station pumps with surface gearing, complete, Angels Quartz Mining Co.; Pacific rock drills, miscellaneous orders for California, including repeat order for three 3½-in. drills, Melones Mining Co.; Gates concentrators, one concentrating table, Plumas county, California; two concentrating tables and one slime table, Nevada.

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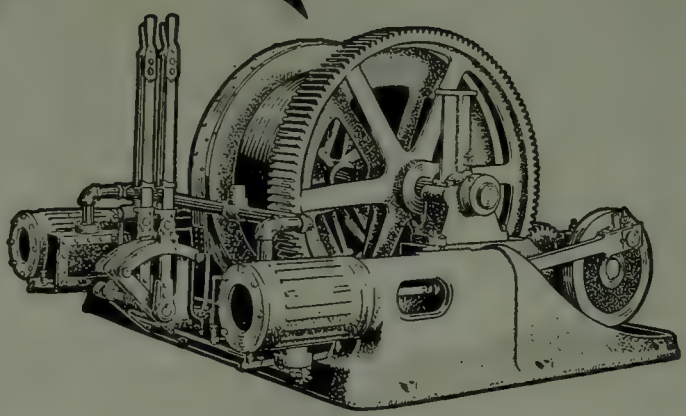

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EDITORIAL

RUMORS that Nevada had a live volcano, prove incorrect. Peavine, like the late Mr. Jeffries, failed to "come back." The invigorating atmosphere at Reno seems to have its maximum effect in stimulating space writers.

CONSOLIDATION is the order of the day and it is now reported that the Ontario, Daly-Judge, and Daly West, at Park City, Utah, are to be brought together. The announcement is premature though negotiations are under way and English capital is interested.

CREDIT for designing the oil heater for compressed air, described in our issue of June 25, should have been given Mr. Charles Legrand, consulting mechanical engineer for Phelps, Dodge & Co. Inc. Mr. Gerald Sherman, superintendent of the mining department of the Copper Queen Consolidated Mining Company, informs us that in practice the expense of operation has been found to run above the estimates because of the difficulty in preventing distillation of the oil at the temperatures used.

NEW ZEALAND has been an interesting proving ground for many social and political experiments. In view of present proposals for change in the land policy of the United States, our readers will, we are sure, welcome the discussion by Mr. A. C. Veach of the New Zealand attitude toward mineral lands, presented on another page. The report from which this was taken was printed as an appendix to the hearings of the Congressional committee that investigated the Forest Service and Department of the Interior.

FOREST FIRES have been causing much damage this month. The principal loss has been in the Coeur d'Alene district in Idaho, where part of the town of Wallace and many outlying homes have been burned. So far the large mines have not been injured, though production has been checked owing to the general demoralization and the absence of the men who are fighting fire. Many a windlass and small prospecting outfit has been burned, and in the end the loss of timber will affect mining, the principal industry of the region. In adjacent parts of Montana and Washington fire is also raging. State and National troops have been called out to assist the officers of the Forest Service, and every effort is being made to control the fire. There has been some loss of life, but apparently this is not as large as at first feared. In southern Oregon and in Sierra, Placer, El Dorado, Trinity, and Siskiyou counties of California, fires are also burning and troops have

been sent from San Francisco. At Eureka the Hidden Treasure mine has been damaged, fire burning the timbers some distance down the air-shaft. Immense damage to the forests has already been done, but so far there has been little loss of life. It has been long since such serious fires have occurred, the patrol maintained by the Forest Service having detected the fires while still small and capable of being easily extinguished.

DEATH overtook the president of Chile, as he landed in Germany August 16. Don Pedro Montt was inaugurated September 18, 1906, and had yet a year to serve as Chief Magistrate. He was an able man and did much for his country. Among the important achievements of his administration may be noted the final settlement of boundary disputes with Argentine and Bolivia, the establishment of a trans-continental railway, the beginning of a line from Arica to La Paz, and a marked general expansion of industry. Chile has turned her energies from war to peace and is systematically and intelligently using the public credit to link her railways into one system, to develop hydro-electric power, to improve her harbors, and to build sanitary works. It is interesting to note that when Mr. Roosevelt started public interest in conservation in the United States, a corps of engineers was already at work in Chile re-estimating the reserve of nitrate; and while the American Congress refused to support a Conservation Commission, that of Chile created one to have charge of the nitrate industry and gave it large powers. A reclamation service has been proposed and will doubtless be established, and agriculture as well as mining and transportation, has received the intelligent assistance of the Government. In all this work Don Pedro Montt had large part and the world as well as his country suffers from his death. Americans feel a peculiar interest from his recent visit to New York and our sympathy goes out to the people of our sister republic.

NOMINATION of Mr. Hiram W. Johnson as Republican candidate for Governor of California, backed up as it is by the selection of Mr. William Kent to run for Congress in the second district, and choice of others of the same faith for various positions, is much the most significant victory the 'Insurgents' have achieved. Indiana and Iowa were expected to rally to the new banner and did so. In Ohio there was the discontent but not the organization and the final result is uncertain. Not even, however, the theatrical campaign of Mr. Cannon in Kansas and his equally dramatic repudiation by the voters of the Sunflower State, is as significant as the California primary election. An unusually large proportion of voters has shown sufficient interest and alertness to go to the polls and vote, and the usual result has followed. Managers of a political machine expect occasional defeats but count on the average result; always having their followers on hand at voting time. Waves of reform are characteristically spasmodic. Aside from the special issues involved in the particular elections of this year, the 'Insurgent' movement is not important if it mean either a mere temporary wave of enthusiasm or only the replacing of one set of leaders by another, and in time, let us say, the substitution of a six-cylinder for a four-cylinder machine. If, however, direct primaries and the activity of the Insurgents actually induce the average voter to take an intelligent interest in political affairs and to be persistent in expressing his opinion, the movement is one of the most profound and far reaching that has occurred in American politics. It is still too early to dogmatize as to this. We can only express the hope that at least a step in the right direction has been taken.

Cyanidation and Smelting

Cyanidation of concentrate involves many difficulties which are being overcome in many ingenious ways. In March, Mr. A. E. Drucker described for our readers the methods used at Taracol in Korea, and in this issue Mr. F. C. Brown, recently manager for the Waihi Grand Junction Gold Company, Ltd., contributes from experience in New Zealand. Interest in the matter is world-wide and the practice is becoming increasingly common. It rests on solid economic ground. It is not only that by shipping bullion in place of concentrate the miner is independent of the smelter, and is paid for his gold at the rate of $20.67 per ounce in place of $19.50, but despite resulting waste of base metal, there is usually an actual economic gain. Smelters must base their charges not on the cost of handling a particular ton of ore, but upon the cost per ton for furnace mixture. Accordingly smelting rates are adjusted so as to best bring out steady shipments of silicious, lead, iron, and copper ores, in the proper proportion for economical handling in the furnace. As the processes of treatment and marketing require time, and steady running necessitates carrying large stocks of ore, interest charges on ore purchased naturally must be taken into account. It follows, without any necessary implication of unfairness on the part of smelter managers, that the rate on any particular ore may be high or low as compared with the actual cost of reducing it, and further that smelting rates on any given sort of ore only meet corresponding rates for treatment by other processes when the smelter needs that ore to preserve the proper ratio in the furnace. Since he must in any event melt much barren material, the cost of doing so has to be assessed against the ore that can best be spared. The basis of fixing an individual rate is therefore the same as in railway traffic—'the value of the service' or 'what the traffic will bear,' depending on the point of view. It is clearly to general advantage that the amount of barren material sent to the smelters should be as small as possible. If therefore a concentrate does not contain sufficient lead or copper to pay the cost of reduction, it may or may not put a burden on other ores, according as its excess of silica or iron is desirable or the reverse. Sulphur is negligible since under present conditions the amount in lead and copper ores alone is greatly in excess of commercial requirements. Not only may a concentrate such as noted impose a burden upon other ores smelted with it, but its handling and transportation involves un-

profitable labor. The freight bill of every civilized country is enormous and it is good economics to ship in the most condensed form and that nearest the finished product, wherever possible.

These natural conditions have been complicated by others that are artificial and in any discussion of smelting rates the ratio of capitalization of the smelting companies to tonnage handled must be taken into account. It is frequently assumed that capitalization is properly measured by the cost of replacing useful plants. This is however, by no means the whole measure of value. Large stocks and deferred sales require abundant liquid capital and the money spent in fruitless experiment is a proper charge on operating expense if the industry is to progress. These and other items properly enter into consideration of charges. Making all proper allowance, however, there seems little escape from the conclusion that the smelting companies have been over-capitalized and that in general too large a part of the profits of the industry has gone to the smelters rather than the miners. Mining involves more hazards than does smelting, and miners should therefore have the larger portion of the speculative profits. Since the security for return in smelting is greater, the rate of profit should be smaller. In America at the present time, this matter is complicated by the fact that practically all of the smelting companies have interests, direct or indirect, in mines, and it is not altogether easy to properly apportion the profits. In Colorado there was for many years an excess of silicious ores. The rate accordingly was made high on ores of that character and low on others. Naturally the first concern of the big smelting companies as they were organized was to assure a steady supply of the then less abundantly mined fluxing ores; which was done by purchase of mines. It was but human that the rates should be continued low on the fluxing ore and as much as possible of the cost of smelting assessed on dry ores. It was equally natural that production of lead and copper ores increased and that miners of silicious ore were driven to develop first chlorination and later cyanidation until the smelting rate on dry ore came to have no relation to the cost of treating the same ore by hydro-metallurgic processes. The obvious course would have been to change smelting rates so as to throw more of the cost on the fluxing ore; thus encouraging production of dry ore and discouraging production of the others. An alternative would have been to reduce rates as a whole. To do either, in any large way, would, however, have interfered with the profits of the enterprise as a whole, and naturally the managers preferred to try for other ways of meeting the situation. As a result the furnaces have been run at half capacity for some time in the hope of the discovery of additional silicious ores containing sufficient gold and silver to permit payment of a smelting charge. This was the natural and the conservative course, and there are good reasons for it aside from any selfish interest in immediate returns. Any arrangement that would permit unlimited production at Leadville and in other districts from which the fluxing ores come, would influence prices of the base metals perhaps disastrously. Gold however is not subject to fluctuation in price and its output can be safely increased. Silver also remains valuable even though it is a commodity. Continued production of the gold and silver is profitable even though the world is not ready to absorb an indefinite amount of lead, zinc, and copper. The hydro metallurgical processes have therefore flourished and now having been shown to be widely adapted to treatment of dry ores are being applied to getting the gold and silver out of the complex sulphides that form the bulk of the concentrates. The fact that cyanidation, in particular, may be economically carried on in small plants is to its advantage but fundamentally we believe that the present ascendancy of the hydro-metallurgical methods of treatment of gold and silver ores rests on the greater demand for gold and silver than for the base metals. A reduction in rates sufficient to allow the smelters to compete for the dry ore, even if possible, would result in an increased production of the base metals that would be disturbing if not disastrous.

Politics and Mining in the Far East.

Far Eastern politics is a deep mystery to most Americans. We are glad therefore to present Mr. Jerome B. Landfield's letter on the political situation in the Far East in its relation to mining. We are especially pleased that he has put in a good word for the Siberian mines, in which we have great faith, and for the much abused and little understood Russian officials. It is true that railway development in Manchuria heretofore has been controlled by the problems of Russian and Japanese strategy. We maintain, however, that this should not be, and in the future is likely to become less and less true. If any strategy is to be taken into account China would seem to have first claim but better still railway building should depend on commercial needs. The lines should link countries together in friendship and business relations as do the American-Mexican railways, rather than be merely parts of rival war engines. Clearly this will be promoted by increasing the number of participating nations rather than the reverse. That the proposal to internationalize the Manchurian railways was not accepted does not discount its inherent soundness. In the long run commercial conditions are like to control and the recent railway convention between Russia and Japan seems to have been more nearly related to growth of bean shipments from Manchuria, and the necessity for through rates by Vladivostok, than to any war measure. The same was true of the opening of Port Arthur. Both were acts of ordinary railway strategy, moves of the traffic director burdened with freight, rather than deep laid schemes of war chiefs. Siberia, Korea, and Manchuria all have much to gain from a reasonable infusion of American miners and capital and just as Mr. Landfield has found by experience that the assumed difficulties in Russian territory disappear before tact and courtesy, so other friends assure us that they find the same true when dealing direct with the Japanese and Chinese in Korea and Manchuria.

The Black Hills of South Dakota—III

By William H. Storms

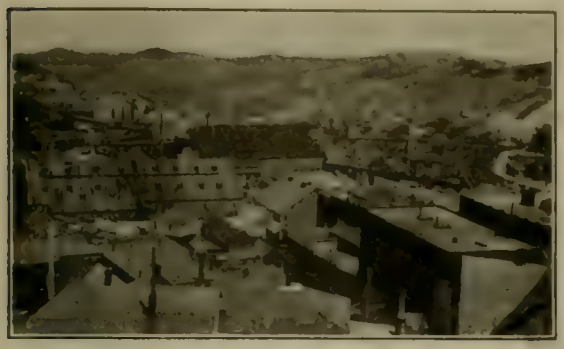
In 1876 the Father De Smet claim was located on the south side of Deadwood gulch, about three and a half miles above the town of Deadwood. A village quickly came into existence there, which was named Golden Gate, after a mine of that name, constituting one of the claims of the Father De Smet group. Numerous locations were made on the great outcrops of red-hued quartzose rocks which extended southeasterly over the hills from the south side of Deadwood gulch to Gold Run, a distance of nearly 8000 ft. On the north side of Deadwood gulch the schists continued with the huge included veins, or lenses of quartz, and the rocks were gold bearing, but they did not possess the peculiar characteristics of the veins to the southward, nor were they of equal value. Another early discovery was that made by the Manuel brothers, two French prospectors, who discovered gold-bearing rock on the north side of Gold Run, about a mile south of the Father De Smet mine. Like all of the other adventurers in the country, they had come in the hope of finding a rich mine, making a quick fortune, and returning to their home; accordingly they named their claim the Homestake. This was early in January, 1876. Other claims were quickly taken up on all sides of them, and the prospects were certainly most encouraging, as the ore all contained gold which could be easily detected by crushing the red rock and panning. The ore was low in grade it is true, very low in fact for a country situated 250 miles from the nearest railroad and in the heart of a hostile Indian country. To make the ore available, heavy machinery had to be brought in from the railroad at great risk and tremendous cost; still the miners were not without hope. The thing that puzzled them most was the unusual character of their ore deposits—immense masses of red rock, with more or less dirty white or red-stained quartz, in most cases without defined walls.

The hilltops were capped with porphyry, covering the ore with a tremendous overburden which, in all probability, would have to be removed. The amount of available water was limited, and what was the best thing to do under the circumstances, was a problem which, as far as they could see, the future must determine. As usual with the Western miner, a solution of the problem was not long in presenting itself. What these great deposits required to insure success was experience, courage, and money. These were soon supplied by capitalists, from the Lake Superior copper region and from California, who visited the mines or sent experienced mining men to make the necessary examinations. Among these latter there was a wide difference in opinion as to the availability of these ore deposits under the then existing conditions. Some condemned them without hesitation, as of no commercial value, others considered them a 'good gamble', and still others were confident that they could be worked with profit if properly equipped and handled on a scale commensurate with their magnitude. It was the men of this latter type who advised the purchase of the claims, and who afterward demonstrated the value of the deposits.

Among the men favorably impressed was Samuel McMasters, a Comstock miner. He had had experience with great orebodies before, and after carefully examining the claims of the Homestake group, unhesitatingly recommended his clients, Hearst, Haggin, and Tevis, to buy the property. This was accordingly done, and Mr. McMasters placed in charge. It was he and such men as A. J. Bowie, of the Father De Smet; Frank W. Allen, of the Caledonia; David Mason, of the Deadwood mine, and a few others, who did things in those strenuous early days, when the situation was without precedent in the annals of mining. There had been big mines opened in the vast desert of the Great Basin region, it is true—the Comstock, with its wonderful bonanzas; the big orebodies of the Eureka district, Nevada; and some others; but those ores were high grade, running from $20 to the ton up into the thousands. Here, on the contrary, were great ore deposits admitted to be worth nominally but $4 or $5 per ton, with a situation but little, if any better, than obtained in Nevada. They planned ahead and outlined the policy of the years of the immediate future. The distant years were yet far away. "Sufficient unto the day is the evil thereof," could well have been their maxim, in the years 1877 to 1885. Later, as conditions changed, methods changed with them; always for the better, always the mining was on an increasingly larger scale. It is true the early-day methods were not the best methods, not the practice of today, but they were good methods for their time and place.

The first mills in the Hills were built in Deadwood gulch, just below Central City, to work the ore from the conglomerate deposits. Soon mills were built to crush ore from the veins, and in less than two years from the date of the discovery of gold in Deadwood gulch, there were in operation in Deadwood, Blacktail, Bobtail, Poorman, and Gold Run, no less than 20 stamp-mills, containing from 10 to 35 stamps each. These mills all had light stamps—650 to 800 lb.—and all were run to their full capacity, night and day. Steam was the only power available and each mill was provided with a whistle, which at the different mills varied in tone with the amount of steam that could be employed to blow it or with the ideas of the owner. No mill was run on standard time, such a thing was unknown then in the Hills, and as the time varied from a few minutes to as much as three-quarters of an hour at the different mills, the effect of the blowing of these whistles was noticeable, particularly as the whistles were blown for all sorts of reasons, and apparently for no reason at all—as signals for ore, for time to go on shift and time to quit; time to eat and time to stop eating; for for the superintendents and for the foremen. Pandemonium seemed to reign in the gulches but, strange to say, if the mills, one and all, did not keep up their never-ending racket a man who had become used to it could not sleep.

Methods in the mills were crude, to be sure, but the cement mines as they were called were rich and so too were some of the veins and the mines could stand the expense. Ore was hauled to the mills in wagons, sometimes during the spring, when the roads were a perfect slough with the axles dragging through the mud. In summer the dust rose in suffocating clouds, and in winter there was often a glare of ice and the roads became extremely dangerous. Indeed, one cold morning, I saw a team of four fine horses carried over the grade by a heavily laden ore-wagon which had gotten beyond the control of the driver, the brakes being useless on the icy roadway. The entire outfit went down the hillside, 180 ft. into Deadwood gulch, killing one horse and so seriously injuring another that the unfortunate animal had to be shot. The other two were apparently uninjured, and the driver of the team saved his life by jumping.



Lead, S. D., General View Showing Homestake Mills.

Lead, S. D., Elison Hoist in Foreground, Water Resevoir on Hill.

Open-Cut, Homestake Mine.

On reaching the mills the ore was broken to proper size for the battery by means of hammers, there being no rock crushers in any of the mills at that time. All feeding was done by shovelers, and 'rule of thumb' was the common practice in milling the ore. All of the mill structures were of lumber except that of the Hidden Treasure, which was of brick. At Gayville, half a mile below Central, and near the present site of what is known as Cyanide Plant No. 2, of the Homestake company, was built a mill of unheard-of design. It was provided with a circular mortar, resembling somewhat the Ball stamps of the Lake Superior copper mills, but much smaller in size. It was equipped with wonderful cauldrons for 'cooking the ore,' and strange, shallow, saucer-like basins for the further treatment of the unfortunate pulp. This mill was built after the design of a spiritualist, but seemed to get no further than the constructive stage the ore not being adapted to the process.

The development of the quartz mines on the Homestake belt now progressed rapidly. Huge open cuts began to appear on the hillsides, at the Father De Smet at Terraville and on the Lead City side in the Homestake Palmetto, and other mines. Underground the great orebodies were being attacked vigorously and the square-set method of timbering was introduced with success, though eventually every large mine where this method of support was employed had disastrous caves, as the result of failure to fill the stopes with rock. First the Golden Terra at Terraville collapsed. At this mine a huge stope, as I remember it now, 150 ft. in length, 100 wide, and about 80 high, had been excavated in the great vein. As stoping had progressed the timbers had been placed after the most approved Nevada square-set method. The stope had been carried up well toward the surface and the dead weight on the timbers was tremendous—too much for them to sustain; consequently, notwithstanding every effort was made to check the subsidence by the placing of reinforced timbers and the building of cribs of solid timber, the ground continued to settle, a crack appeared on the surface marking clearly the area of subsidence, and toward the last the ground settled so rapidly that it was deemed impossible to save the stope. The men working below, some 30 in number, were ordered out of the mine, but too late for four of them, for the huge mass crashed down, even as they were leaving the stope. Two were thrown against the

walls of a drift by the concussion, and two were caught in the falling rock and timbers, the others, including the four who were imprisoned in the cave for several hours, escaped without injury. Later the Caledonia, the Highland, the Homestake, and the De Smet caved in much the same manner, differing only in detail, but all due to the same cause; that of relying too much upon the timber sets to hold the ground, instead of filling the stopes with waste rock as is now the practice.

The first large sale of consequence in the Hills was the transfer of the Father De Smet, Golden Gate, and Justice mines to a California company on December 29, 1877, for $400,000. By mid-summer, 1878, the Homestake company had acquired considerable property in Lead City, around the ground originally purchased from Manuel brothers, and had begun the construction of their first mill of 80 stamps. This was known as the Homestake mill and now contains 200 stamps. The Golden Star company soon thereafter built a mill of 120 stamps, to be followed by one on the Highland, with a similar number. Just over the hill at Terraville, the Golden Terra company, was developing a great mine, and the Deadwood company, adjoining it on the north was doing even better, and both were about to be equipped with large mills. Later these two mines were consolidated and their mills were joined. The De Smet company built a mill of 100 stamps in 1878. This mill was unlike any of the others in its arrangement, and I have never seen another similar to it elsewhere. The stamps were arranged in a double row of 50 stamps each, with the mortars facing and a central aisle between the two lines of amalgamating plates. The particular advantage of this unusual type of mill construction was the fact that it afforded greater bin capacity than the other type, where the batteries were placed back to back, and furthermore that it permitted an unobstructed view of the interior of the mill, which was considered an advantage. The Caledonia company, at Terraville, built a mill of 60 stamps in 1878, which was later increased to 80. Prior to this the Caledonia had a light mill of 20 stamps.

By the mid-summer of 1878 the placer mines in the vicinity of Deadwood had mostly been worked over at least once, and some of the ground, in the more shallow parts, twice and even as much as three times—Chinese usually making the final clean-up. Occasionally a rich spot that had been overlooked, was discovered and good pay was the result as long as it lasted, but such happy finds were generally short lived, owing to the small area that had been left. In a small way, placer mining was still carried on in some of the neighboring gulches, Two Bit and Pedee gulches being the most important of these, but nothing was ever found in any of them to create more than a passing interest.

Reference has heretofore been made to the occurrence of a bed of local conglomerate in the bed of Deadwood gulch. This calls to mind a story in connection with this cement bed. The owner of a placer claim on Deadwood about a mile above town had been one of the fortunate ones. That is, his claim had proved to be one of those that paid well, but the pay began to fall off and the owner feared he was about to run into a poor streak, whereupon he decided the proper thing to do was to sell, if he could induce any one to buy at a sufficiently high figure. The road between Deadwood and Central passed directly over his claim, and many vehicles passed daily, among them several hacks which were usually loaded with passengers. One afternoon a passing hack stopped opposite the working pit and an elderly man alighted. The claim owner was engaged at the moment in panning down the day's clean-up, to which, as he observed the approach of a prosperous-looking stranger, he did not hesitate to add with a liberal hand from his buckskin.

As the newcomer drew near, the miner said in his most cordial manner, "How d' do, stranger. You're just in time to see a fine bit of gold," at the same time giving the pan a dextrous twirl which exposed a handfull of dull golden grains and small nuggets.

"My gracious!" exclaimed the stranger, with surprised interest and admiration, "and that is gold."

"It sure is," responded the miner, "and just to-day's work, too, d' ye mind. Just look at it."

"And what do you estimate it to be worth?" inquired the tenderfoot.

"Oh," replied the miner in a careless tone, "there's a hundred and fifty, I should think, if it's a cent," and then added with convincing nod of the head, "You can bet this claim is one of the best of them."

"Well," responded the stranger, "that is fine—fine. I think mining must be a most interesting business, particularly when it is profitable, as it seems to be here."

"There, ye have just hit it exactly," exclaimed the miner, in admiration. "That is it exactly—when it is profitable, as 'tis here," and then added, sententiously, "I think a good deal of this claim."

"How many men do you work?" asked the stranger.

"Five, generally, besides myself," was the reply.

"And that gold then represents the work of six men for one day?" inquired the pilgrim.

"Call it five," was the ready response of the miner, "I don't do much myself. It's about $30 a day to the hand."

"I should call that very good," remarked the stranger.

"Good!" exclaimed the mine owner, "I'll gamble ye'll not see any better the length of the gulch this day."

"Would you sell out!" inquired the tenderfoot.

"Sell," said the miner with thoughtful intonation. "Sell," he repeated, "why, yes, I'd sell anything I got, provided I got my price."

"What do you ask for your mine?" now inquired the stranger, as he watched with much interest, the men down in the pit getting ready for the next day's work.

"Well," was the cautious reply, "I'd take $12,000 for it right now. It might get better, ye understand, and then I don't know as I'd be willing to let it go for that. In fact," he continued, "if it wasn't

for this rheumatism I have. I don't believe I would care to sell at all."

"Twelve thousand dollars," repeated the old gentleman, half to himself while he continued to gaze earnestly into the mine workings where the sluices were mounted on trestles and a China pump driven by a water wheel, was slowly scraping the water out of a little basin in the bedrock.

"No hurry about it," said the miner. "I'll tell ye what to do. Come up again tomorrow morning and run the mine a day for yourself and see how 'tis done. Ye'll understand it better then, and ye can see, too, what good money there is in it—twelve thousand dollars, it's dirt cheap."

The next morning the stranger was at the mine at an early hour, but not early enough to see the mine owner 'fix' the face of the working pit. The latter evidently felt that he could not afford to trust wholly to luck on that day of all others, so he added gen-

Highland Hoist, Homestake Mine.

erously to the prospective clean-up from his prolific buckskin. As a result of this forethought on his part, the clean-up that evening exceeded $250, and the stranger decided without further parley to take the mine at $12,000, and the two went down to Deadwood where the transfer was legally consummated.

Three days later the miner went up the gulch to visit the new owner of his mine and incidentally to remove some of his personal belongings from the cabin, and was surprised to notice that the stranger had discontinued mining where he, the former owner, had been working, and had removed the entire crew of men to the extreme lower end of the claim and was busily engaged in cutting a drain ditch down through gravel and cement to the bedrock beneath.

"What are ye doin'," he asked, as he surveyed the work from the bank. "Ye don't need a drain-ditch, man."

The tenderfoot explained that he had 'discovered' that the cement was not the true bedrock, that the former owner had been working on the cement, which, although it paid well, was a 'false bedrock' and that the pay was very much better on the 'true' bedrock underneath it, and that as a result of this fortunate 'discovery' he now had two pay-streaks instead of one. The former owner of the mine said very little, but thought much, and later remarked to intimate friends: "An' I took him for a tenderfoot. He's from Californey, and knew more about a mine in a minute than I ever will, and I'll bet he saw that false bedrock the minute he set foot on the ground."

Curves of Comfort

By Mark R. Lamb

With the thermometer standing at 120° the farmers of Imperial valley, California, work in the sun and are not uncomfortable, Le Neve Foster says. In still saturated air at temperatures above 80 or 85° it is hardly possible for men to do hard continuous work, even when stripped to the waist." "Saturated air" is still a useful term the Weather Bureau to the contrary notwithstanding. To the ordinary man it means air mixed with a maximum amount of water vapor. In South Australia, in a shade temperature of 115°, men wear starched collars and work in offices without fans, while in Shanghai at a temperature of 95° life may be rendered hardly worth living even with cellular shirts and electric fans.

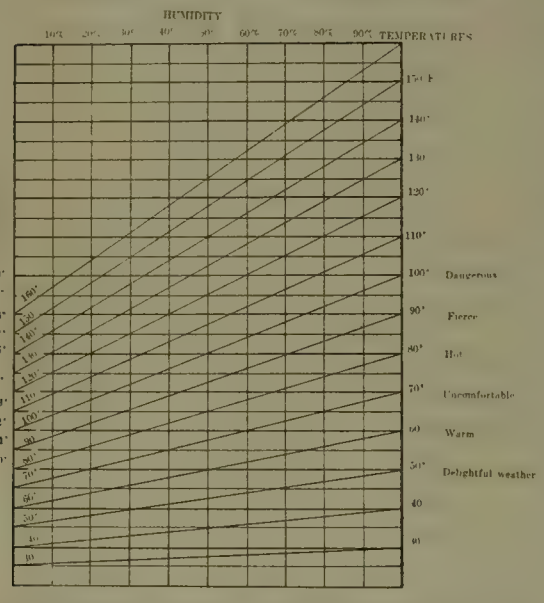
How climate may affect us certainly is not indicated on the thermometer or on any other existing instrument. Periodically it is discovered that readings of temperatures alone do not convey a correct comparative impression of the bodily effects of air temperatures and water vapor quantities in combination. Besides these two factors, wind velocity also has an effect. For example, it is not sufficient to compare alone the temperatures and humidities of the breezy desert air and the dead air of a stope.

The New York *Times* suggested that the Weather Bureau give one figure including temperature, humidity, and wind velocity instead of each of these items separately, but the Weather Bureau replied that, "The problem is much more difficult than is here suggested. We have frequently explained that the sensation of temperature differs with every individual, and will vary with the same individual according to his physical and mental conditions. We think it must be left to each individual to predict his own sensations when once the Weather Bureau has predicted the temperature, moisture and pressure of air, and the wind velocity."

J. W. Osborne attempted to form a scale, but individuals differ so entirely in their sensations that "nothing satisfactory could be made out of a year's record of twenty observers." In 1872 he derived an arbitrary 'scale of sensations' expressed both by terms and by numbers, and he took account of wind as a most important climatic factor. Even with the three factors, however, the scale would not be perfect since the occupation of the observer is an important factor. For example, it is a well known fact that in Colón the coolest spot is at the end of the veranada toward the boarding-house, just where the suspicion of a breeze makes a little eddy. The majority of the workers on the Canal Zone cannot sit on that corner of the porch, however, so the tabulation should not be based on conditions there. Again, the sensation of the bare-headed shoveler in the sun differs from that of the pith-helmeted, pajamaed overseer who carries an umbrella. The above differences do not constitute a valid objection to the construction of a diagram which will indicate the feeling of the latter better than mere readings of

degrees Fahrenheit. This individual is usually imported while the former is entirely satisfied with the climate(knowing no other), and in any case is not interested in climatic comparisons. In fact, it may be stated as a general proposition that the out-door man has little time or inclination to criticise the climate—and also that he cannot choose his climate. Having thus scientifically eliminated the three factors of sun, wind, and labor the construction of our diagram is much simplified.

W. F. Tyler, of Shanghai, has tried to find out what function discomfort is of temperature and humidity. Taking zero as a condition such that when suitably dressed no personal discomfort is experi-



enced—an ideal summer day in Shanghai—and taking 10 as the maximum discomfort in the same city, then, within the range of his observations, the degree of discomfort is given by the expression d — 1.2 (d—w) — 66 where d and w are readings of the dry and wet bulbs respectively. As compared with the diagram accompanying this contribution, Mr. Tyler is willing to stand a higher temperature or humidity on a pleasant day, probably because his formula is based on observations taken out of doors, in moving air. My diagram has been prepared from observations begun in 1898, and taken at numerous places in North America, including such extremes of temperature and humidity as are observable in Death valley and in New York City. At the top are percentages of humidity; at the left is an arbitrary column of degrees of discomfort and at the right is a column of degrees Fahrenheit. The maximum bearable with saturated still air may be taken at 100°. In order to make clearer the gradation in the column of 'Degrees of Discomfort' I have added a scale of terms which require no explanation.

To compare conditions in two localities it is necessary either to know the relative humidities, or to obtain them from the differences between the readings of the wet and the dry bulb thermometer. The relative humidity is obtained by reference to the table prepared by the Weather Bureau.

For example, the temperature in Milwaukee today is 80° and the relative humidity is 55%, so that we are experiencing 3° of discomfort. At Yuma the temperature is 100° and the humidity is 12%, so that so far as bodily comfort is concerned the two places are the same.

It is not difficult to picture the big Swede at the Daggett borax works, comparing his thermometers and finding the humidity 10% and the temperature 130 degrees!

"Mercy!" he says to the station agent. "Six of discomfort is enough for m-m-me! I wo- wo- wonder what it is in nu- nu New York."

"Pretty bad there," replies the agent. "Los Angeles tells me they are dying in the East. The temperature is only 90° but the relative humidity is 90 per cent."

The Swede runs his pencil a little way down the 90° diagonal to the 90% humidity line and across to—

"Well, l- l- look at that! Seven and a half of discomfort, and here we are only up to six! I'm glad I don't l- l- live in nu- nu- New York! That sure must be a hel- hel- healthy man's town!"

A FUSION METHOD

By George A. James

The following method may be of service to some of your readers. I have used it a number of years with uniform success: To economize time it is best to remove such bases as possible with acids as is the usual practice in other methods. The dried insoluble is mixed with two or three times its weight of sodium carbonate, and where unoxidized bases exist, sufficient potassium nitrate for their oxidation. The melt is made in a silver, platinum, or nickel crucible, according to the purpose of the analysis, as small portions of the crucible enter the fusion. Although this amount is minute it may have a bearing on the analysis, and should be remembered. The silver crucible is preferable in most cases. The melt is carefully heated over a Bunsen burner or alcohol lamp, until all moisture is driven off and the mass begins to cake. A piece of caustic potash, of weight equal to the substance, is placed in the crucible so that it may be made to touch the side, or a stick is pressed against the sides of the crucible until sufficient has melted and run down to bring the whole mass into fusion. This takes place almost immediately. The solution of the fusion is made as in other methods, taking the ordinary precautions for fluorides.

The advantages of the method are, its saving of time (but a few minutes are required), its not requiring a blast lamp or muffle, the smaller quantity of material to be evaporated, and the greater solubility of the melt. In the fusion of chrome iron the fusion may be greatly improved by a similar method. The chrome iron, mixed with sodium peroxide, is heated until it begins to show incipient fusion, when a small piece of potassium hydrate is added. It will be found that the effect is to bring the whole mass into immediate fusion. I have seldom found it necessary to re-fuse as is most generally the case when sodium peroxide is used alone.

Examination of Petroleum Properties

By Chester Lyon

Geologic work for the determination of oil territory is generally combined with the making of careful topographic surveys.* In carrying on this work, level lines are carried along roads, stream channels and crests of ridges and the elevation taken of all prominent outcrops that can be recognized as marking geologic horizons. This results in gathering a mass of accurate data for determining the intervals between important beds of rock and also the geologic structure or lay of the rocks. Level lines are also run to the mouths of any oil wells in the area, so as to determine the elevation of the oil sands and other beds of rock, whose positions are recorded on the logs of the wells. From these the intervals and degrees of parallelism that exist between the outcropping and sub-surface rocks can be established. By direct comparison the intervals between the different outcropping beds can be obtained. The structural relation of the surface and underground strata must be determined for each area examined, but a knowledge of the conditions existing in a number of different areas may show what can be expected elsewhere.

There are certain general geological conditions that should be known before undertaking the determination of the geologic structure of the oil-bearing sands from strata upon the surface, the first, and most important, being the possibility of an unconformity between the surface strata and the oil-bearing stratum. It is necessary to have a knowledge of all the factors governing accumulation in any attempt to define oil territory. These are, porosity of the reservoir rock, the geologic structure, and the degree of saturation by water. The first can be determined only by the drill; the second, under favorable conditions, by careful geologic work on the surface; the third by drilling a few test wells. Knowledge of the first and third factors is absolutely necessary for a correct interpretation of the surface structure shown by the map. For instance, in an area where two or more sands are productive, the map may show producing wells on the anticlines, along the steep slopes, and also in the bottoms of the synclines, the productive area not appearing in any way to conform to the structure; but, if the top of the water in each of the sands be determined, it will be seen that the sand yielding oil on top of the anticline, is not the one from which oil is taken in the trough of the syncline and furthermore is free from water. The sand in which oil occurs along the slope is, on the other hand, saturated with water up to a certain level immediately above which the oil occurs. Partial saturation is the condition most generally found, in which case accumulations of oil may occur anywhere with reference to the geologic structure. It is most likely, however, to occur upon terraces or levels as these places are favorable to accumulation in both dry and saturated rocks. Under all conditions the most probable locations for the accumulation of gas are on the crests of anticlines. Small folds along the side of a syncline may hold a supply of gas or the rocks may be so dense that gas cannot travel to the anticline but will remain in volume close to the oil.

It must be acknowledged that absolute determination of the occurrence of oil in any one locality by work on the surface, even where assisted by a study of the known underground conditions in developed territory is not possible. However, it is possible to calculate the degree of probability for finding oil from a careful study of indications and structural conditions. Drilling in new or unproductive territory is necessarily a most speculative venture. Any one of four results may be the outcome of the well where the sand is pierced. First, the sand rock may be found to be hard and close, incapable of holding oil or permitting the flow of any liquids through its mass. Second, the sand may be good but perfectly dry. Third, it may be good sand and be completely saturated with salt water, which may fill the well to a depth of several hundred feet, or, in some cases, even flow out upon the derrick floor. Fourth, oil may be found in such quantities and with such pressure that it will gush from the well at the rate of thousands of barrels a day, or there may be only a gradual seepage into the well amounting to but a barrel or two a day.

No fixed rule can be made for the selection of drilling sites in new territory, as much depends on the character of the strata. A new field should be tested by a series of wells at right angles to the strike of the beds so that beds of a different horizon are tested in each case. In no case should the non-success of a single well be considered conclusive evidence as there are few oil fields where there are not dry holes even in the midst of highly productive wells. In California conditions are exceptional in that so far no dry holes have been found in the midst of productive territory, except where the drilling has not been done properly. The reservoir sands here are so porous that any well tapping them, and properly seated and cased, yields some oil. Where there is an unbroken anticlinal fold with gently sloping sides, the best site is near the crest, but when the anticline has unequal slopes steeply inclined, the wells should be placed somewhat away from the crest on the less inclined side. Where the anticline exposes a broken crest and the oil-bearing series outcrops at the surface, or the rocks are merely covered by a local series lying unconformably upon the inclined petroliferous beds, the placing of wells is decided on the basis of the relative inclination and the position of oil-bearing rocks. If the dip exceeds 50° wells should be fixed to penetrate outcropping petroliferous beds at a depth of 800 to 1500 ft., but where the angle of dip is in the neighborhood of 20 to 30° a fair test can often be made by placing the well to strike the outcropping beds at 400 to 800 feet.

The presence of petroleum in the rocks of a district is not always indicated by any outward signs

*Details as to these methods will be found in the reports of the United States Geological Survey, such as Bulletin 318, and to 'Petroleum Mining,' by A. B. Thompson, to which readers are referred for further information. These reports have been freely used in preparing this paper.

that give the least clew to a casual observer. Many of the oil fields of the world owe their discovery to the accidental finding of oil in wells sunk for water or in the search for brine. Prospecting for the latter led to the discovery of oil in the United States. The physical characteristics of petroleum-yielding regions vary widely in different countries. The prevalence of oil at times exerts a marked influence upon the topography of a district as a consequence of its injurious effect upon vegetation, but this latter is influenced to a great extent by the frequency and amount of rain or the prevalence of long droughts. Where petroleum-bearing beds outcrop at the surface or are only covered by a superficial deposit of soil or alluvium, there is often a seepage of petroleum which, exposed to the action of the atmosphere, is converted into a more or less solid mass of asphalt. The character of the residue which accumulates depends upon local conditions and upon the quality of oil, as well as upon the topographical nature of the ground, for instance, where the oil oozes from outcrops of the sides of hills, all traces may be removed by rains. Surface indications, that may be considered favorable for the presence of oil, are mineral springs, natural gas, springs of petroleum, porous rocks saturated with bitumen, cracks in shale, and other openings in rocks filled or partly filled with bitumen. In the Santa Maria district of California, deposits of asphalt are associated with petroleum-bearing formulations occurring as veins, impregnations, and surface effusions. Frequently streams or pools of water have an iridescent coating of oil on the surface. Compounds of iron floating on water give a similar appearance and are often mistaken for oil. Which is present, can be determined by agitating the surface of the water with a circular motion. If the scum is iron it will break into irregular fragments; if oil, it will form bands of color. As a rule deposits of petroleum and bitumen occur in porous formations over-laid by impervious strata, such as shales or slates. In search for oil all outcrops of stratified rocks are of interest. There are generally better exposures of these rocks along the sides of streams, in canyons, and in gulches. If any brown or black material is seen in the seams of the rocks or porous strata, tests should be made for bitumen, using such solvents as bisulphide of carbon, chloroform, or turpentine which usually give a black or dark brown solution if bitumen is present.

In the examination of properties already producing, it is necessary, besides going into geological, geographical, and topographical details, to obtain accurate information on the following points: Number of wells and their condition, whether productive, exhausted, or dry; Log of each well, if obtainable, giving the depth and thickness of each distinct formation penetrated, with lithologic character and place of beds yielding oil, gas, tar, or water. The record should also give the production of each well compared to what the well produced when first opened, it being particularly important to notice whether there has been a gradual or sudden falling off in the flow. The variation of pressure compared to the variation in other wells in the vicinity, and the distance to wells compared should also be noted as these indicate open communication between wells or otherwise. An analysis of the oil should be made compared with oil produced from wells in the same district. The presence and quantity of water, fresh or salt, also of water in the nearby wells is of importance, as the penetration of water strata by nearby wells may flood the oil strata and cause serious trouble. Some of the most promising new oil fields have been suddenly and completely flooded by water and the area had to be abandoned. There has been legislation in several States to protect producers from negligent, short-sighted, or criminally careless methods which might result in destroying or damaging valuable wells. Notes should be made of the cost of each well and of any special difficulties in drilling; the kind of pump and power used, cost per barrel of oil raised; the storage facilities, whether tanks or reservoirs, and capacity; the separation of oil from water and sludges; and any special features that have been brought to light by development.

In most oil fields the oil is raised mixed with salt water, and often the oil from flowing wells is intimately mingled with a large proportion of salt water. The great Mexican gusher which in 1908 yielded some 400,000 tons of oil in two months, eventually produced chiefly salt water at a temperature of 160°, the flow being estimated at from 35,000,000 to 50,000,000 gallons daily. In the Russian oil fields fresh water is so scarce that the main sources for drinking are obtained from evaporators.

Titles and the legal status of any existing lease of contract are matters that should be carefully investigated. The disposition of the product and the price should be determined since the commercial handling and marketing of oil is one of the most important factors in oil production. Usually sale is arranged by contract with one of the large purchasing agencies. A normal price to the producer in California at the well, would now be in the neighborhood of 25 to 30c. per barrel for fuel oil. Most of the larger corporations purchasing oil land, now figure on oil at the well at 25c. Any considerable rise in price could only be due to a deficiency in the supply, which is extremely improbable, or to a decided increase in demand. The recent high prices have been the cause of great activity in wild-catting and in the development of new wells. This obviously greatly increased the production and could not but react against the price because of overtaxing the marketing facilities.

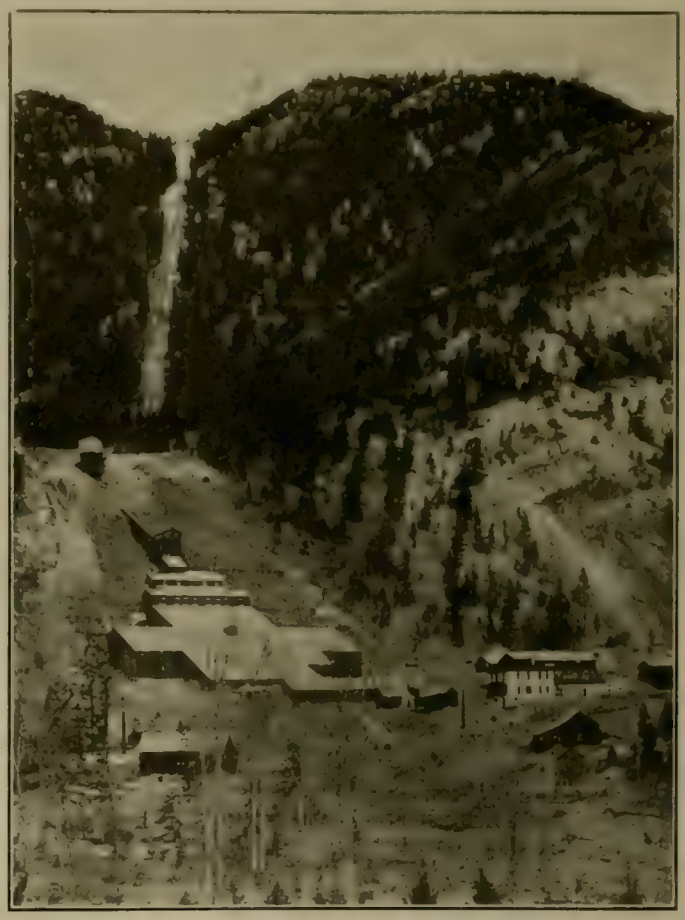
In Alaska much of the land is covered by a layer of moss. It has been the practice to plow the moss under. In the cold soils the moss is slow in rotting, and there appears to be a tendency for a greater acidity to develop. It has been found that a better plan is to tear up the moss by light plowing, followed by harrowing, and after it has become dry to burn it. By this method uniform stands and good crops have been obtained the first season, whereas several years are generally required for equal results if the moss is plowed under.

The Nickel Plate Mine and Mill

Staff Correspondence

Among the gold mines of Canada the Nickel Plate is one of the most successful. It belongs to and is operated by the Hedley Gold Mining Co. and is situated on Nickel Plate mountain, in the Osoyoos division of the Yale mining district, British Columbia. The company's mill, power-house, and office buildings are at Hedley, situated on the Similkameen river, the mine is 3½ miles east of Hedley, and nearly 4000 ft. higher. The Great Northern Railway Co. is extending its line from Oroville, Washington, to Vancouver, B. C. and affords train service up the Similkameen valley through Nighthawk, Keremeos, Hedley, and Princeton, the last-named being the present terminus. The Similkameen, just large enough to be called a river, heads in the Hope mountains and flows into the Okanogan, at Oroville. The valley is narrow, but has a productive soil, as is evidenced by the fields of hay and grain, and the orchards. A number of smaller streams flow into the Similkameen through side-canyons; among these is Twentymile creek, the waters of which are brought through a flume and pipe-line to the Hedley company's plant to drive Pelton water wheels. The Hedley Gold Mining Co. owns 24 Crown-granted mining claims, the principal development being on three of them. The mine was opened in 1899 by the late Marcus Daly, and it was operated by him, and after his death by representatives of his estate, till August 13, 1909, when it passed to the control of this company by purchase. I. L. Merrill, well known at Bisbee, and elsewhere, is president of the company, with C. D. Fraser as secretary and treasurer, and G. P. Jones as general superintendent. The Daly Reduction Co., whose stock is controlled by the Hedley Gold Mining Co., operates the mill, W. D. Thornton being at the head of the subsidiary company. The greater part of the mine development, the construction of the mill and tramway, were accomplished under the management of M. K. Rodgers. He was succeeded by R. B. Lamb, and the latter by F. A. Ross. Mr. Ross was the last one of the managers under the Daly ownership. G. P. Jones, now general superintendent, has been connected with the property for the last ten years as mine superintendent. The credit for opening and developing the mine under difficult conditions, and the installation of excellent equipment, undoubtedly belongs to Mr. Rodgers and Mr. Jones. During the first few years of development machinery and supplies were sent in to Nickel Plate mountain from Penticton 40 miles away, on Lake Okanogan. After the Great Northern had completed its railroad to Oroville, freight was hauled from that place up the Similkameen valley. Three years ago the railroad was finished to Keremeos, and only within the last year has train service been established to Hedley and Princeton.

The orebody, consisting of a gold-bearing silicate of lime, has a thickness of 10 to 80 ft., has a dip approximately 25° between a hanging wall and foot-wall of andesite. The gangue, made up of epidote, garnet, and calcite, contains gold in free state and also in association with arseno-pyrite. While some high-grade ore has been mined and milled, the general average is now about $12 per ton. The mine was developed and is being operated through a series of adits driven from the side of the mountain. There are nine of these, and ore is being hauled out through five. The plan followed has been to drive these adits into the foot-wall to the orebody, then to sink inclines on the ore, which is hauled in mine cars to the top of the inclines by air-hoists. The pillar and chamber system is employed, and no timber is used. No. 3 adit reaches the orebody at a distance of 700 ft. from the portal: No. 4 adit, 150 ft. vertically below No. 3, cuts the orebody 1300 ft. from the entrance. While there are three other ore-shipping



Nickel Plate Mine of Hedley Gold Mining Company.

adits, No. 3 and No. 4 are the ones from which the greater tonnage is shipped. The ore is hauled in 2-ton cars from the farther ends of the principal adits by electric locomotives to the surface, where the trackage connects with a 9000-ft. electric line, over which the ore is hauled in 12-car trains down a 5-ft. grade to the transfer bins at the head of a 10,000-ft. gravity tramway. This tramway, which is operated in two sections, has three rails, with a fourth rail at the passing stations. This trackage from the upper terminal to the mill-bins makes a descent of 3900 ft. The ore is hauled over this tramway in 5-ton skips, the up-bound and down-going skips traveling in balance, always subject to the controlling machinery at the head of each section. At the centre station, where the two sections connect, the skip is merely attached to the cable that operates on the section over which that skip is destined, and detached from the cable that serves the section over which it has just passed. Some parts of the tramway trackage have an incline of apparently 40°. Compressed air, for the drills and hoists at the mine, is conveyed from the power-house at Hedley through a 6-in. pipe, 17,000 ft. long; and the electric power for the ore-haulage and other purposes at the mine is generated at the same power-house, transmitted to the lower terminal of the electric line, where it is transformed from an alternating to a direct current by a Westinghouse motor-generator for the electric-haulage system.

The ore passes from the lower tramway tipple to two jaw-crushers by which it is reduced to 1½-in. size, and is conveyed thence to the mill-bins, having the capacity of 1600 tons. The crushed ore passes automatically to the four 10-stamp batteries made up of 1050-lb. stamps. Formerly each stamp dropped 6 in. and 106 per min. Within the last three months such changes were made as to give the stamp a 7¼-in. drop and 99 per min. The result is said to have been an increase in the crushing capacity of 600 tons per month for the 40 stamps, without making any change in the screens which are 20-mesh. Certain installations of new equipment in the mill are being made without interrupting the regular operations. When the new equipment is ready the batteries will crush to only 16-mesh, the pulp will be classified by 8 Bunker Hill screens, the coarse product to be concentrated over 8 corrugated belt vanners; the vanner tailing will be pulverized to 100-mesh in a 100-ton Gates tube-mill, having Montana-Tonopah lining. The tube-mill product will unite with the fine from the Bunker Hill screens (which runs less than 60-mesh), and after being reground will pass to classifiers and hydraulic sizers; the coarse from the latter is to be concentrated on 16 smooth-belt vanners, the fine from the sizers passing to 10 Deister tables. The middling from these tables is to be reconcentrated over two other similar tables. The tailing from the smooth-belt machines will pass to the sand vats; the tailing from the Deister tables to the slime vats. This shows the method of separating the sand from the slime. No part of the sand will reach the leaching vats coarser than 60-mesh. The cyanide plant, as formerly constituted, provided for leaching the sand 12 days in the upper vats and 14 in the lower; but when the new methods shall be in use, by the time this is in print, there will be only the single treatment of the sand, and the proportion of sand will be but 25% of the whole. The plan is to collect the slime in four 200-ton settlers, from which is is to be pumped into six 200-ton agitating tanks, wherein mechanical agitators are to be used. The gold solution is to be decanted from the agitating tanks and treated by two Merrill precipitation presses, in which zinc dust is used. The slime residue in the agitating tanks—that remaining after decantation—will pass to two Oliver filter-presses, the solution to pass to the precipitation presses and the caked slime into the river. There is no crushing in cyanide solution, the first cyanide being introduced into the sand vats and into the agitating tanks. Under old arrangement and methods from 15 to 20% of the total saving has been made on the amalgamating plates, 55% by concentration, and the balance by cyanidation. Since January 1, 1910, the total extraction reached 93%. Discarding the amalgamating plates is being considered, though this may not be done. The concentrate product, the base of which is arseno-pyrite, amounts to 200 tons per month and runs high in gold. By coarse-crushing in the stamp batteries, followed by regrinding, it is estimated that the capacity of the mill can be increased from 160 to 200 tons per day. The consumption of cyanide per ton of sand and slime treated amounts to ½ lb., and costs 10c. per ton. The cost of mining and milling, as shown by the last three months operating, was a little less than $5 per ton of ore treated. Recent experiments led to the modifications now being made. Roscoe Wheeler is the company's metallurgist, with C. W. Merrill consulting. The present force of 140 men is larger than usual, due to the construction work. Ordinarily the force amounts to 75 men. The report for the quarter ended June 30, showed a net profit of $99,154, equal to three times present dividend requirements. The dividend rate is 3% quarterly.

The power-plant is hydro-electric, with steam auxiliary equipment. The flume by which water is diverted from Twentymile creek and delivered at the power-plant, is 13,000 ft. long, coming through the penstock at a pressure of 187 lb. per sq. in. The electric machinery consists of a 100-kw. A. C. Westinghouse generator, direct-connected to a Cassel water-motor; there is being installed a 360-kw. Westinghouse A. C. generator, direct-connected at one end to a 400-hp. Goldie & McCulloch Corliss condensing steam engine, and connected at the opposite end of the shaft to a 400-hp. Doble water-wheel, thus permitting the plant to be operated by steam or water-power, or both. The plant contains six return tubular boilers, aggregating 325 hp. The air-compressor, a cross-compound, 2-stage machine, is direct-connected to, and driven by, an 18-ft. Pelton wheel. Formerly the mill machinery was operated by water-power direct, but now electric motors are being installed throughout the mill to supplant the water-power, the water motors are being retained, however, as auxiliaries.

Cyanidation of Concentrate

By F. C. Brown

Probably most ores will come under the class of ores containing gold and silver finely disseminated through the various mineral constituents as there are but few cases where all the valuable metal is in the form of free gold and silver, or where the gold and silver is in such forms as to be easily dissolved by cyanide solution. The ores and cases to which I especially wish to direct attention are those where the metals, other than gold and silver, if recovered in the form of concentrate, are not of sufficient value to cover shipping and treatment rates on the concentrate. In these cases, and there are no doubt many of them, it is advisable, if possible, to treat the concentrate at the mine for the recovery of the gold and silver, and allow the lead, zinc, copper, and other metals, to go into the tailing.

For the last three years I have been at a mine in New Zealand where just such conditions were present. The ore consists of a gangue of quartz and calcite containing the following minerals finely disseminated through it: iron pyrite, zincblende (chiefly the black variety), galena, some copper pyrite, and traces of arsenic, antimony, and selenium. By analysis it was estimated that 8 to 10% of the total weight of the ore consisted of these minerals. The gold and silver value of the ore was about $9 per ton (of 2000 lb.), about $1.50 of this being silver. There are no smelting concerns in New Zealand. Any concentrate produced has to be sent at heavy expense to Australia, and it was found that although 40% of the total value of the gold and silver content of the ore could be recovered in the form of concentrate there was little profit from the sale of the concentrate after paying bagging, carting, shipping, and treatment charges.

Upon taking over the management of the mine I at once made arrangements for treating the concentrate at the mine, and a special cyanide plant was erected for this purpose. The results were highly satisfactory as it was found that a 90% recovery was effected at a fairly reasonable cost.

The concentrate treatment consisted of the following steps: (1) regrinding in tube-mill; (2) agitation by compressed air in Brown (Pachuca) tanks with fairly dilute cyanide solution; (3) vacuum filtration. Great difficulty was experienced in grinding the concentrate sufficiently fine. Some idea of the fineness necessary may be obtained from the fact that, before regrinding, all the concentrate would pass 200-mesh sieve and it was estimated by time settlement-tests made in water, that the reground material would all pass 400-mesh if such a sieve were obtainable.

A fairly large tube-mill was required for about 10 tons of concentrate per day (24 hr.), so it can readily be seen that the power consumption per ton was high, as was also the wear of pebbles and liners. After running the plant some months I came to the conclusion that such fine material by itself is too fine for economical grinding in tube-mills, and this opinion was strengthened by the fact that later although very much finer grinding of the ore was tried and consequently finer concentrate produced the percentage of extraction after regrinding was lower than when the ore was being crushed coarser. From this I inferred that the concentrate was not being reground as fine as before.

In order to overcome this difficulty it was decided to try adding coarse sand to the concentrate as it entered the tube-mill, the idea being that this gritty material would help the grinding in the same manner that the barn-yard fowl picks up grit to grind its food. The result of this experiment was even beyond our anticipations, as it was found that the extraction was increased some 3 or 4%, and the wear on liners and pebbles was materially reduced. It next occured to me that the concentrate might advantageously be reground in the tube-mills used for grinding the ore, provided some simple method could be devised for continuously feeding it to these mills, there being always a good supply of coarse gritty material in these mills to assist the grinding. After numerous experiments such a method was devised and the success of the scheme was all that could be desired. This meant the abandonment of the special concentrate-treatment plant. The total extraction on the ore was higher than when the concentrate was treated separately. It is now about 90%, and the costs for labor and chemicals are considerably lower. This method of treating the ore and concentrate together has already been briefly described (the result of a communication from me), in an article by A. Grothe, president of the Mexican Institute of Mining & Metallurgy, which was published in the proceeding of the Institute for August, 1909, 'Cianuración de Concentrados,' but this further reference to the method will be of interest to some. I have come to the conclusion since arriving in this country, that there are many mines in the Rocky Mountain regions situated away from the railroads, which, if they had a plant at the mine that would give a high extraction of the gold and silver content of the ore in the portable form of bullion bars, would give the owners materially increased profits compared with the present system of shipping the concentrate. This method of treatment might also bring about the resumption of work on some mines and the opening up of others.

COST OF MINING

In an article descriptive of Radersburg, Montana, which appeared in this paper August 6, the statement was made that the cost of mining was $15 per ton. This figure applied particularly to the Black Friday mine, and contemplated total cost of mining, transportation, smelter charges, and all other expenses, and it is believed that this will be materially reduced within a short time by improved methods. The general cost, at present, of mining, transportation, and reduction of the ores of the camp is about $8 per ton. As soon as arrangements have been completed to treat the ore at the mines this cost will be reduced several dollars per ton in saving of transportation charges alone.

New Zealand and American Mining Law—A Contrast

By A. C. Veach

*The United States in dealing with its national domain early endeavored to separate mineral from non-mineral lands. At first this was accomplished by the automatic means of reserving in all grants and patents the minerals which were then considered of importance. Under this practice it was impossible for any deposit of gold, silver, copper, or lead, to be wholly alienated. This plan was soon abandoned for one in which the separation rested entirely with the officials. They had the power to absolutely reserve from sale under the ordinary land laws any lands which were known or supposed to contain minerals and to lease the same, but such reserved mineral lands could be sold only by special act of Congress. If land was not specifically reserved in this way it could be acquired under the ordinary land laws and the grants or patent in such cases contained no reservations. This plan was practically abandoned in the forties and there developed the present more drastic one which absolutely prohibits the sale of any mineral lands except under specific acts. These mineral laws provide for the sale of mineral lands under certain special conditions and at a higher price than that charged for non-mineral lands. No provision was made for leasing or for the insertion of mineral reservations in grants. In the administration of the laws in this third period the Government officials no longer took the initiative of making definite mineral-land reserves analogous to the lead and copper reserves of the preceding period. The policy of the land office during this third period was essentially a passive one. In the beginning of the period the difficulty of determining by field examination and classification what were and what were not mineral lands resulted in the initiation of a plan which endeavored to throw on the purchaser the responsibility of making this determination, and which has persisted more or less unchanged to this day. Under this plan the land office has required the agricultural claimant to assert under oath that the land was not mineral land and that he was acquiring it not for its mineral value, but only for the purposes of settlement and cultivation. Until recently the land office as a general rule has accepted such a declaration as entirely conclusive, and the administration, decisions, and rulings of the land office during the earlier period did much to make this declaration a mere form and to afford plausible excuses to persons desiring such conscience salves. As a result large areas containing valuable minerals are claimed at present under agricultural patents.

In this plan of shifting the responsibility from the land office to the purchaser, and in the fact that a higher price was charged for mineral than non-mineral land is found a most hopeful possibility of remedial action, a possibility of recovering to the Nation all mineral values except those disposed of under the mineral-land laws. If Congress should enact at this time that in every case, both in the past and future, where the purchaser of land from the Government made a non-mineral affidavit, that all minerals belong to the Government, it would leave each man with exactly what he swore he was getting and exactly what he paid for. Such an act would be eminently just. In individual cases it would be less severe that the attempt that is now being made in the Western States to recover to the Government by lawsuits mineral lands acquired under agricultural-land laws. In these cases the Government seeks not to take from the patentee everything; it asserts that the patentee has been a perjurer and has defrauded the Government. Under the plan here suggested all such points of difference and all such charges vanish. The oath is regarded not as perjured statement, but as an honest indication of intent and desire. The claimant's statement that he was acquiring the land only for agricultural purposes is made binding on him. The charge of fraud likewise falls; the Government has under this solution not been defrauded; it has sold the agricultural values and received the usual price therefor. The patentee retains what he bought; the Government what it did not sell. This is a solution of the matter of Western 'mineral-land frauds,' which can but appeal to all men as entirely fair. On the point of legality of such enactment the question, if any, to be decided is not, Would a court of law sustain such a contention if made under existing practice and ruling without specific enactment? but Has Congress the power to pass a law which but confirms to the Government the ownership of certain things which it has never sold and which at the same time leaves to every patentee from the Government exactly what he swore he was getting and exactly what he paid for; no less, no more? Eminent lawyers have stated that they believe the Supreme Court would look at the matter broadly and hold such an act constitutional.

New Zealand from almost the very beginning has shown a like desire to separate mineral from non-mineral lands; its laws have always authorized the sale of known mineral lands and do today; there has been no general enforcement of the common law right of the Government to the precious minerals. They are today, as in the United States, controlled by the owner of the freehold. There are no 'mining on private property' acts, and while some lands are under certain conditions subject to resumption without payment for gold or silver values, it may be said that for most purposes deeds, as in the United States, are now held to convey all minerals. In some respects the New Zealand laws may be regarded as more liberal than those of the United States. New Zealand has never declared that "in all cases land valuable for minerals shall be reserved from sale except as otherwise expressly directed by law." The land department has never required of any purchaser a declaration that he is not acquiring the land for its mineral value, and thus by his own declaration practically estopping him in equity, though not

*Abstract from 'Reports on Mining Laws of Australia and New Zealand'. Government Printer, Washington, 1910.

in present practice from claiming the mineral values which may be in the lands purchased. The New Zealand land laws have however incorporated several discretionary features not found in the American laws; they have empowered their officials to grant mining leases, to make reserves for public purposes, to refuse to sell any land, and to fix the sale price of all lands. These discretionary features have made possible a degree of efficient and intelligent business administration which is surprising to an American.

The result is that while the United States has disposed of its mineral lands without let or hindrance, New Zealand has disposed of practically no mineral lands as such. A search through the old government and provincial gazettes during the early period when the provisions for sale were most explicit, and when notifications of such sales were required in the gazettes, failed to reveal a single notice of this kind. The mines department reports that no known mineral lands have ever been sold by the Government. Among mining men not one knew of the Government sale of a single piece of land as mineral land, and several stated quite positively that such a sale would not only not be tolerated but would be illegal, which certainly indicates that the custom of not selling mineral lands has been followed so consistently that it has generally come to have the force of law. Some lands containing minerals have been sold, but the freehold lands that are now known to contain commercial minerals are restricted almost wholly to areas containing lignite or brown coal, which were disposed of very early in the history of the colony. It is estimated that in 1906 the coal derived from private property in New Zealand did not exceed 30% of the total tonnage, and represented a much smaller percentage of the total value. The value of all minerals, including coal, derived from freehold land did not in that year exceed 10% of the total; indeed, Charles Rhodes, secretary of the Waihi gold-mine, and one of the leading mining men of New Zealand, estimates the amount as less.

The net result of the administration of the minerals contained in the public domain of the United States and New Zealand for the past sixty years is that, while both have provided for the sale of mineral lands and neither has reserved minerals in patents or grants, in the United States all the mineral production is either derived from freehold land or land that is in process of becoming freehold, while in New Zealand 90% of the whole mineral production comes from areas held under lease from the Government. Truly, this result but corroborates the statement called forth by the investigation in Tasmania that the patriotic and efficient administration of the land affairs of a country is not a human impossibility. The country in which these results have been attained is one of no mean mineral wealth and is one in which the mining industry is in a very healthy and progressive condition. It contains, in the Waihi gold mine, the most productive gold mine in Australasia and the third or fourth in the world. It has the third most productive colliery company in Australasia and is second only to New South Wales in its total coal production. It has been the centre of several gold rushes, which following those in California and Victoria to some degree depopulated the Victorian fields and attracted many from California. It has produced in a little over 50½ years more than $350,000,000 worth of gold, and with but little over one-sixth the area of Alaska produced in 1905 three-fourths as much gold, five times as much silver, and many times as much coal. It has one-third more area and about three times the population of Utah, and in 1905 produced one-quarter more coal, about twice the amount of gold, and one-eleventh the quantity of silver.

JOHNNIE MINING & MILLING COMPANY

The property of the Johnnie Mining & Milling Co. embraces 19 claims and various water rights in Nye county, Nevada, about 14 miles from Amargosa. Development consists of an 850-ft. working shaft and nearly two miles of underground workings. The orebodies are found on a limestone-quartzite contact, the vein striking northeasterly and dipping 45° to a depth of 450 ft. Below that the dip varies between 18° and 30° until the 700-ft. level is reached, where the vein becomes steeper. The gold ore is found in shoots and chimneys that have been found to increase in size and tenor of ore to the present depth attained. The vein is from 4 to 20 ft. wide, averaging 10 ft., and the ore contains from $6 to $10 per ton. The shaft, which is 854 ft. deep, will be sunk to the 1000-ft. level. The 100 ft. between the seventh and eighth levels was sunk in 35 days, and the 900-ft. mark will probably be reached by September 10. Cross-cutting for the vein is now progressing on the 800-ft. level, and at the present rate, 4½ ft. per day, the orebody should be reached before the end of August. On the 700-ft. level the vein showed a width of 22 ft. and the dip of the wall there indicated that the width at 800 ft. will be between 25 and 30 ft. From 65 to 70 tons of ore per day are being treated in the mill. This consists of 16 Nissen stamps and one slow-speed Chilean mill. It is planned to increase the mill capacity to 200 tons per day. There will also be installed at the mine a hoisting plant of 200 tons per day capacity. It has not yet been decided what kind of power will be used. The Tecopa Water Co. has promised water-power by the last of November and this will be utilized if it is ready. If too long a delay is probable the plant will be designed to use oil fuel. The company has leased its Fraction claim to a syndicate called the Fraction Leasing Co. Work has already been started and it is expected that a 22-hp. hoist will be installed by September 1. This claim is developed by a shaft 170 ft. deep and about 250 ft. of driving on two levels. The contract with the leasing company provides for the sinking of the shaft to the 400-ft. level. In the meantime workings from the Johnnie will be extended and eventually connected with this shaft, thus providing an air-shaft and another means of egress from the main workings. Arrangements are being made to lease the Minnie May claim and it is expected that work will be started before long.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Gold Mining in the South

The Editor:

Sir—It is rare now-a-days to hear anyone speaking seriously of gold mining in the Southern Appalachians. I have noted your editorial on the subject in the issue of July 23 last and was much interested in the attempt being made by the Columbia Mining Co. to arouse interest in gold mining by offering advantages to prospectors which they have not previously enjoyed. The experiment will be worth while and the outcome awaited with interest. I spent some years professionally in that region and know it, together with a good many of its advantages and disadvantages. I am, therefore, much interested in anything that promises to put mining there on a solid basis. In 1904 I was called upon to investigate conditions at one of the then most promising mines in that part of the country. I found a state of affairs which could hardly have been worse. Every piece of equipment on the property had been bought second hand, and none of it was in condition to give good results, most of it being unsuited in design to the work required of it. The vein consisted of 4 or 5 ft. of talcose quartz schist, assaying from $12 to $20 per ton. The gold was extremely fine and only about 60% of it could be saved on the amalgamation plates, and the valuable tailing was run to waste in such a way that there was no possibility of ever recovering it. No records of any kind were kept, even the assay value of the ore being unknown. All the facts I had to have to make an intelligent investigation, I was obliged to dig out myself by a long series of samplings and experiments.

Hoisting was accomplished by bucket without any kind of guides in the shaft. The ore broken in the faces was wheeled to the shaft in wheelbarrows, dumped on the floor, shoveled into the buckets, and hoisted. At the surface the bucket was dumped on a platform, shoveled into a wheelbarrow, wheeled about 100 yd. to the mill, dumped on the floor, where it was broken by hand hammers, and then fed by hand into the mortars of a light 20-stamp mill. I have seen better mills than this one on the junk heap.

It would take too much space to detail the condition and methods obtaining, but the above is a fair sample. I made many reforms and built a small plant to cyanide the tailing, which gave excellent results as long as I remained. When I left, the management went back into the old hands and a policy of reversion began again. Everything was changed as much as possible, even the stamp feeders being thrown out and feeding by hand resumed. In my opinion it is this sort of thing that has killed Southern gold mining. The people have no experience to guide them and they will not follow the counsels of those who ought to know. The man with the divining rod gets a much better welcome than the legitimate engineer. The mine of which I have been speaking should have yielded a handsome profit, but as a matter of fact no one made anything out of it, and it was finally sold for its debts. There are a number of good deposits of gold in the Southern Appalachian region, low grade generally it is true, but some of them extensive, and with proper management they could be made profitable. The metallurgy is usually not difficult, the great need is simply good business management and efficient technical direction.

H. A. MEGRAW.

San Louis de la Paz, Mexico, August 8.

A Cyanide Problem

The Editor:

Sir—In your issue of August 13, I note a communication signed 'Mine Owner, Tucson, Arizona,' in which the writer, after stating that among the contributions to the technology of cyanide treatment, little or nothing is to be found concerning the economic treatment of antimonial ores says, that "if some one of the numerous contributors * * * would tell how the antimony in this ore may be eliminated, or at least rendered innocuous, it would be appreciated by many having mines producing ores of similar character." As a member of that body of men who have put in years of study, research, and hard work on the treatment of gold and silver ores, I should say that the mine owners certainly would appreciate such information, given them gratis, but would like to ask 'Mine Owner' whether he considers it good business for metallurgists to give away the results of their work and experience in this manner? While it is true that the surgeon or physician gives any discovery which he may make, to the profession, through the medium of the technical press, the analogy ends there, for the profession is protected by law and the methods so given out cannot be taken up and practised by pharmacists and prescription clerks the world over. Let us take the case of manufacturing companies who employ technical men in their experimental departments. I have myself worked in this capacity and I know just how zealously all so-called 'trade secrets' are guarded. If this be good business in the case of the company, why is it not the same in the case of the individual, who makes his living by his knowledge of such matters? Information of this character is valuable, and although the methods of extraction available for the class of ores cited are rather involved and more costly than simple treatment, satisfactory results can often be attained by the man who knows how, where failures have preceded, and the extraction is almost entirely a business question, which a careful and competent metallurgical examination will answer in the surest possible manner.

METALLURGICAL ENGINEER.

La Jolla, California, August 16.

[We happen to know that our friend who signed his name 'Mine Owner' has strong conviction on the point raised by 'Metallurgical Engineer,' and for the present we shall leave the answer to him.—EDITOR.]

Far Eastern Politics and the Mining Industry

The Editor

Sir: Americans are as a rule exceedingly provincial and display but little intelligent interest in what is taking place outside their immediate neighborhood. They have some vague general notions of geography, and experience a passing thrill when a catastrophe on a grand scale befalls some foreign locality, but even in matters of this sort the interest is rather that of a spectator looking to see if his own country will be outdone. To the credit of the profession, however, it must be said that our mining engineers are an exception, and that they are among the few Americans who follow keenly the trend of affairs outside our boundaries. It is natural that this should be the case, for every year sees an increasing number of our engineers called to the four quarters of the globe. They are the real missionaries of economic progress, and just as they play a large part in developing the resources of new regions, so the political conditions and relationships of these regions govern to a large extent their opportunities. It is the object of the present letter to point out the bearing of certain movements in the Far East on mining and on the opportunities for mining work in the future. To treat the subject exhaustively is out of the question; all that can be attempted is to call attention to a few points of interest.

The discovery of gold at Nome, following close after the Klondike excitement, awakened much speculation as to the possibilities of profitable mining on the opposite coast, and in 1900 a concession was obtained from the Russian Government under which a joint Russian and English expedition, of which I was a member, vainly explored the northeastern coast of Siberia. This is the concession which has since been exploited by John Rosene and his friends. Just before this several rich placers had been discovered farther down the Siberian coast, and interesting mining developments were taking place in Korea as well as in southern Manchuria. All of these things had a tendency to focus the attention of mining men on these regions just at a time when diplomacy was concerning itself with their ownership, as well as with the question of Siberian transportation and its outlet on the Pacific. With the change of the Russian railway plans and the occupation of Port Arthur I have nothing to do here. But one point is of interest and has great significance in dealing with the question of what the Russian Government is going to do in the way of developing eastern Siberia, and the attitude Russia will take toward foreign participation in this.

The public has been led to believe that the war with Japan was due to the aggression of the Russian Government in Manchuria and Korea. This is a great mistake, for as a matter of fact, the whole Russian movement in the Far East that led to the Russo-Japanese war was one of private enterprise in which a certain clique of promoters and politicians utilized their 'pull' to carry through in a high-handed manner territorial aggressions in which the Government had no interest. In many respects their method of working the Government for private ends of a fraudulent character was similar to that of the group of politicians who carried through the Noyes-McKenzie deal at Nome in 1900. It was our good luck in the latter case that the thieves were dealing with their fellow citizens and did not tread on the toes of a foreign nation. An understanding of this point makes it easier to interpret the present attitude of the Russian Government toward the development of eastern Siberia, especially as far as Americans are concerned. The war attracted the attention of Russians to the Pacific littoral for the first time since the early fur-trading days, and in their attitude toward it they are divided into two camps. One party believes that to develop far eastern Siberia is to spread out too much, and that the energies and capital of Russia should be employed nearer home, especially on her southern Asiatic frontier. They argue that to develop rich mines in the Maratime Province is to arouse the cupidity of the Japanese before they are prepared to protect the region. In this class are those whose cry is 'Russia for the Russians,' and they are opposed to the proposed repeal of the law which for strategic reasons was enacted some years ago, by which foreigners are not allowed to own or operate mining property in a zone or strip 100 versts, or about 65 miles wide, along the frontier; a law which though general in its application, was directed especially against the Japanese. The other party is more progressive and is steadily increasing in importance. It argues that if emigration on a large scale from European Russia to the rich valley of the Ussuri were encouraged, and if Americans as well as Russians were led to develop the mining country of the Amur and the Pacific coast, the region would soon be able to defend itself. Although this point of view is opposed by many of the officials of eastern Siberia, it is gaining strength and will prevail.

From the standpoint of American mining interests, American diplomacy in the Far East has been a series of stupid blunders. Foremost of these was Mr. Roosevelt's interference in the Russo-Japanese war. Had this war continued two months longer, we should not now be facing Japanese domination of Korea and Manchuria, and at the same time Russian aggression would have ceased of its own accord, since it had been private and not national. This initial blunder has been followed by others that have finally resulted in throwing Russia and Japan into each other's arms, as evidenced by their recent treaty.

Stop for a moment and consider how this was brought about, and see how our State Department under the guidance of P. C. Knox managed to bungle the railroad situation to our detriment. A group of New York bankers desired to participate in a scheme to build railroads in northern China, and after a series of proposals, which included the neutralization of the railroads in Manchuria, the proposition was brought forward to build a railroad from Chin Chow to Aigun. It was pointed out that this would be entirely in Chinese territory, and while paralleling the Manchurian road now controlled by Japan for some distance, would develop a lot of new

territory and also act as a feeder for the Trans-Siberian. Our State Department was apparently surprised when Russia declined to concur in this plan. A glance at the map will reveal the reason. The proposed railroad would run for several hundred miles straight across country at right angles to Russia's sole line of communication with the Pacific. Its construction, with the Japanese near at hand as the dominant power, would close to her forever all hope of developing, or even holding her Far Eastern provinces. Think of what it would mean to Russia to have a railroad built right across her front reaching one of her richest mining regions, a road which if neutral in name, could be seized at any moment by the Japanese, a move which would instantly render the Trans-Siberian road useless from a military standpoint, and even prevent the use of the Amur river for summer transport. Is it remarkable that Russia vetoed such a ruinous proposal and viewed with suspicion the schemers who made it? It should be remembered that it was this same precious bunch that brought about the brutal recall of Charles R. Crane, our Minister to China, one of the best diplomatic appointments ever made by this country, because they found that he would be an obstacle to their nefarious designs. In answer to this absurd railroad project, Russia made a counter proposal, a railroad from Pekin to connect with the Trans-Siberian at Chita. This road would have followed a great caravan route and would materially reduce the time of travel from Europe to Pekin. It was an eminently fair and reasonable proposition, but it did not suit. The Japanese and their friends, the English, are intensely jealous of the Trans-Siberian because it has seriously interfered with the passenger business of their steamer lines, and to cut down the time of the trans-continental journey another day or two was not relished by them.

Russia saw the position at once and realized that America, upon whom she ought naturally to count as an ally to preserve the open door in Manchuria, had stupidly turned against her and was playing into the hands of the Japanese. What could she do? The natural thing under the circumstances was to close a deal with Japan on the best terms possible. This was just what Japan desired. Ever since the war she has done everything in her power to bring about a rapprochement with Russia, with a view to checkmating America, whom she fears and hates, and this was her opportunity. Russia would have liked to have been lined up alongside of America, but our cheap politicians threw away the chance and forced her to make a compact with Japan. Under the circumstances the outlook is dark for American enterprises for the development of the wonderful mineral resources of Manchuria and Korea. After several years of the most cruel and barbarous exploitation of the Korean people, Japan is on the point of annexing Korea definitely. The situation in Manchuria is not much better and there is not longer even the pretence of the open door.

On the other hand there are unlimited opportunities for American mining enterprises in Siberia, and the attitude of the Russian Government is favorable. The Russian mining laws are fair and liberal, in fact, in the matter of the size of claims and the basis of tenure they are too liberal, allowing large tracts to be held as locations on the payment of a small annual tax, and requiring no assessment work. Any American who will take the pains to acquaint himself with the provisions of the mining code, and will then use a little courtesy and tact in his dealings, will find Siberia an excellent country in which to mine.

From the standpoint of international peace and of a satisfactory solution of the problems of the Far East, it is a great pity that Russia has been so shamefully and maliciously misrepresented in the American press. The public, which relishes the sensational, does not realize that nine-tenths of all that is published in the papers about Russia comes through the hands of a committee organized by professional revolutionists for the purpose of influencing public opinion against the Russian Government. If a committee of disgruntled Americans desiring to injure our Government, were to make a business of circulating in the press of Europe lurid and exaggerated accounts of riots, lynchings, and graft exposures in the United States, to the exclusion of all other news, their position would be entirely analogous to that of the committee above mentioned, and they would find infinitely more material for their purpose.

The result is that Americans are now inclined to believe any tale concerning Russia and are in general becoming strongly prejudiced against her, an attitude which Russia cannot understand. This is all wrong, and in the interest of our future diplomatic relations should be corrected. Incidentally it behooves mining men to realize that Russia offers greater opportunities for mining development than any other part of the world today, that they can mine there in peace and safety, and that if the tide of foolish prejudice based on falsehood and misrepresentation can be put to an end, there will be no difficulty in persuading American capital to seek investment there.

JEROME B. LANDFIELD.

Binghamton, New York, July 24.

Copper was once supposed to occur at only a few places in the United States, but it is now known to be widespread. Most of the deposits are of low grade, but improved modern methods of treatment have made low-grade copper ores valuable. In Bear Lake county, Idaho, copper deposits occur near Montpelier. They are mostly carbonate ores. Their value has not yet been definitely proved, nor is their extent known. The chief project for their development is the Bonanza shaft, which has gone down 350 ft., but has not yet shipped ore. Shales, stained green, maroon, and chocolate by iron, abound in the region, the colors mimicking those of copper stains and misleading the prospector, who supposes that their vivid tints are indications of copper. The ores run only about 2%, but may be made to pay by proper treatment. The deposits have been described by H. S. Gale in Bull. 430, recently issued by the U. S. Geological Survey, and forming a part of 'Contributions to Economic Geology, 1909.'

Concentrates

Most of these are in reply to questions received by us. Our readers are invited to ask questions and give information dealing with the practical mining, milling and metallurgy

Lithia mica is a silver gray to violet colored mica and is valuable chiefly for the manufacture of lithia salts

In concrete mixing the proportions, 1 cement, 2 sand, and 4 broken rock, will usually give satisfactory results In many situations a mixture containing less cement is adequate

The Granby, B. C., smelter is one of the largest in the world using blast-furnaces alone. The tonnage smelted during 1909 was 1,050,000 tons from which there was produced 22,200,000 lb. of copper

Removing soil from the sites of new mills or for any less purpose, is done cheaper by hydraulic stripping than in any other way, provided the necessary water under a good head is available, and the sluicing of the débris onto lower land does no damage.

Tracks underground should be substantial. It pays to construct them so in mines as well as on the surface, and to keep them in good condition. Rough tracks that derail cars, frequently are expensive, costing more in loss of time than would be required to fix them properly.

Petroleum is obtained at a number of places in Wyoming, notably in the Popo Agie field in Lander county, and west of the Black Hills in Converse county. Wells were driven in the latter field as early as 1880, and the oil used as a lubricant at the mines of the Black Hills.

The tendency of centre posts to cut into the hanging wall plates of shaft sets in inclined shafts can be checked by inserting a heavy head-block between the top of the post and the cap. This head-block should be at least 14 in. long, 4 in. thick, and as wide as the wall plate.

Crucibles are readily made, the work requiring no great skill after a mold has once been procured. From drawings or a model a master mold of iron is first made. Such molds should be obtained from a clay-worker's supply house. From it plaster of paris molds are made and in these the crucibles are cast.

Segments for the annular ring used in gasoline melting furnaces, at the level of the top of the melting pot, may be cut from massive steatite (soapstone), which is abundant in some localities, particularly in California. A suitable iron may be attached to each segment to lift it from its place or to put it in position.

A series of experiments was recently made at Johns Hopkins University to determine the dielectric strength of air. It was found that the point at which a brush discharge occurred is only slightly affected by the moisture in the air. From dry air to saturated air there is a drop in voltage of the discharge of less than 2%. An increase of temperature from the freezing point to 40° C. caused the lowering of voltage by about 3 per cent

Few men have been able to work in a caisson deeper than 100 ft. This, until lately, was considered the limit of depth to which caisson workers could go A new record was recently established in excavating for the foundations of the Municipal building in New York City, where a caisson was sunk to a depth of 112 ft. 1 in. equivalent to 3.4 atmospheres, or 49.5 lb. per square inch

The Powder River coalfield is a small part of a large area of coal bearing rocks, known as the Northern Great Plains Province. Beginning at Casper and Douglas, on the North Platte river in Wyoming, this province extends northward between the Black Hills and the Bighorn mountains, occupies the eastern part of Montana and all the western half of North Dakota, and reaches into Canada.

Pulleys for power transmission are now made of concrete. They are made in two sections (split pulleys), the sections being kept apart during molding by a sheet of tin. The core for the passage of the shaft may be made by inserting a wooden plug of the proper dimensions. The pulley may be mounted by having suitable flange plates bolted on the sides, the flanges being provided with a key-seat, by means of which it is keyed to the shaft.

Careful experiments are being made by the metallurgists of the Rand to determine to what extent the carbon present in lime used in the cyanide process causes a precipitation of gold from the solution. From the investigation thus far made it is evident that a very small percentage of carbon in lime is permissible, having no deleterious effect on the solutions. The necessity for using only well-burned lime has, however, been made evident.

Micas may be distinguished by what is known as the percussion figure—a six-rayed star, made by striking or pressing a sharp point against a plate of mica. The trade employs a variety of terms by which mica may be commercially described. Thus, dealers speak of 'rum,' 'ruby,' 'amber,' 'white,' and 'black' mica, referring to the color. There is also 'ruled,' 'ribbon,' 'wedge,' 'A,' 'hair-lined,' 'fish-bone' or 'herring-bone,' and 'tangle-sheet' mica, referring to structural peculiarities, or to inclusions.

Black diamonds, or carbons as they are called, used in diamond-drilling, are practically useless unless of the best quality. Each stone should be carefully examined under a strong lens, search being made for flaws, porous condition, or other blemishes. Fragments of larger stones are better than small individual stones, as they can be more readily examined and flaws detected, than in the individual stones, where a surface gloss sometimes obscures physical imperfections. Stones that are flawed are likely to break, causing direct loss, while porous stones will usually wear away rapidly, running the cost of drilling up to prohibitory figures.

Special Correspondence

TORONTO, CANADA

Cobalt Shipments. — Government Rebate. — Porcupine Power Plants.—Electric Railway Surveys.

The record of shipments from Cobalt for the first seven months of the present year gives a total of 17,980 tons, as compared with 17,651 for the corresponding months of 1909. In view of the increased number of concentrators at work and the shipment of large quantities of concentrate instead of low-grade ore, this indicates a highly satisfactory condition of affairs. The bullion shipments for this year's period amounted to 347,797 oz., valued at $136,333. The leading producing mines maintained their position well. La Rose headed the list with 3493 tons, as against 3754 for the seven-month period of 1909, followed by Nipissing with 3233 tons, against 3424; Kerr Lake, 3132 tons, against 661; Crown Reserve, 1948 tons, against 1818; and McKinley-Darragh, 1013 tons, against 559. The Waldman and Wyandoh are among the new shippers on the list, and the Provincial, Casey Cobalt, and Hargraves reappear after having been inactive for some time. Among last week's shippers and consequently not included in the seven-month record is the Rochester, which has made an initial consignment of 30 tons. Notwithstanding the good showing lately made by Kerr Lake the stock has recently suffered severely from a bear raid based on the report that the best veins have given out at depth and that the ore to maintain dividends at the present rate will not be forthcoming. Beyond this retrograde movement, from which the stock is now recovering, the market has been devoid of interest, what between mid-summer dullness and the depressing effect of the slump in American stocks, which always reacts on the Cobalts. Lately there have been slight symptoms of a rally, due less to any revival of public interest than to the picking up of stocks at bargain-counter prices by traders in the hopes of a general revival this fall.

E. P. Earle, president of the Nipissing Mining Co., Ltd., reports that the Meyer vein has decidedly improved, yielding 8 in. of 3000-oz. ore at the second level. Vein 122 has been traced on the surface for 600 ft. and is being developed on the 100-ft. level. The new orebody recently struck on vein 64 shows a width of 2 ft. of high-grade ore in places on the 270-ft. level. A good discovery has been made on the 135-ft. level of the Princess property of the La Rose. In exploration work on the Fisher-Eplett belonging to the same company, two new veins, each about 3½-in. wide, have been found in the cross-cut from the Shamrock shaft at the 200-ft. level. The Buffalo paid an extra dividend of 3% August 15, making 16% paid in dividends this year, amounting to $160,000. On the Coniagas two more orebodies have been opened on the third level, veins No. 4 and 6 having been picked up at 225-ft. depth. The payment of the regular dividend of 3% per quarter has been resumed. A site is being prepared for the new 20-stamp mill of the Temiskaming & Hudson Bay shortly to be installed. The Ontario Government has made a material concession to this company as regards royalties on low-grade and concentrating ore. It will continue to pay 15% per ton on all ore mined, but a rebate of $3.50 per ton will be allowed for treatment charges on all ore passed through the mill. The Chambers-Ferland has recovered its 'Off-shoot' vein on the third level by cross-cutting over 100 ft. from the shaft. It varies between one and two inches, but is extremely rich. At the Temiskaming high-grade ore is being mined at the 400-ft. level, the veins at that depth showing no signs of deterioration. The main shaft is down over 500 ft. and another level will shortly be run.

The principal drawbacks to the development of Porcupine, namely, the lack of transportation and the consequent difficulty of obtaining cheap power, will shortly be removed. Two hydro-electric plants are to be installed in the neighborhood. A. E. Walberg, of the Mines Power Co., Cobalt, has secured a large water-power on the Mattagami river, nine miles from Porcupine, and A. M. Bilsky, of Cobalt, and H. D. Symmes, of Niagara Falls, Ontario, have leased the power at Sandy Falls, Mountjoy township, a few miles west of the Tisdale line, for the development of between 4000 and 5000 hp. for transmission to the mines. It is expected that both these enterprises will be able to deliver electricity next summer. An electric railway will be built connecting the district with the Temiskaming & Northern Ontario by a syndicate which includes A. Ferland, Chas. A. Richardson, W. C. Chambers, A. J. Burdett, and W. A. Gordon. The conditions on which the Government granted permission to build the road involved the immediate beginning of the enterprise and its completion by January 1. Survey parties are now laying out the line. Its western terminus will be on the Mattagami river about a quarter of a mile from the Timmins mine, but the exact point at which it will connect with the Temiskaming & Northern Ontario railway has not been decided. Development operations at the camp have been much interfered with by the scarcity of provisions and supplies. An important discovery has been made in diamond-drilling at the Dome where a vein containing free gold shows at a depth of 100 ft. A complete plant has been ordered for the Foster in southern Tisdale where a 20-ft. vein of dolomite is shot through with quartz stringers, both containing free gold which is also found in the wall-rock.

LONDON

Australian News. — Broken Hill. — Associated Gold Mines. — Vivien Gold Mining Company.

The Broken Hill Block 10 has been adversely affected by the recent coal strike in Australia. It has not been possible to work the mine and mill for more than 10 weeks out of the 26 included in the half-year September to March. During that time 32,683 tons of ore yielded 4773 tons of lead concentrate containing 2949 tons lead and 170,289 oz. silver, the recovery being 38% of the silver and 71.5% of the lead. In addition 27,877 tons of zinc tailing was produced averaging 17⅛% zinc, 4⅛% lead, and 9¼ oz. silver per ton. The amount received for the lead concentrate was £37,228, and the accounts were also credited with £1393, being 1s. per ton on the zinc tailing produced during the half year. The expenses were £38,909 and the costs incurred through cessation of operations £4274. In addition £8630 was written off for depreciation, and £458 placed to income-tax account, so that the loss for the year was approximately £11,000. As, however, the balance in hand at the beginning of the six months was £153,218, it has been possible to continue the payment of dividends, £20,000 being disbursed, being at the rate of 2% on the capital £1,000,000. The company also has an asset of £88,886 due for zinc tailing sold to the Zinc Corporation and the Amalgamated Zinc (De Bavay's). This amount is being received in monthly and quarterly instalments spread over a number of years. In addition the company has an accumulated stock of unsold zinc tailing amounting to 89,700 tons and this is continually increasing. Seeing that flotation processes have been proved commercially profitable on Broken Hill tailing the directors decided to treat their own. Accordingly four units of Elmore vacuum plant were ordered and were completed last month. This is estimated to treat 800 tons per week, and when it is in working order additional units will be provided to treat the total production of zinc tailing, 2000 tons per week. As regards the mines, development at Block 10 has not given satisfactory results recently. The 1615-ft. level is not yielding such high-grade ore as was found above. The lode is from 8 to 9 ft. wide, averaging 10 oz. silver, 8% lead, and 5½% zinc, and the rhodonite content is high. The main shaft is to be sunk 100 ft. deeper. The reserve of ore is estimated at 600,000 tons which can be extracted at the rate of 2500 tons per week. At the Southern lease, a lode 5 ft. wide averaging 9% lead, 5½% zinc, and 1½ oz. silver is being developed. Another property has been bought during the half-year, namely, the South Comstock, at Zee-

han Tasmania for which £900 was paid. This contains a complex zinc lead-silver ore which should be amenable to modern methods. V. F. Stanley Low, the general manager for the company, is now on a tour around the world visiting America as well as Europe.

Associated Gold Mines of Western Australia was formed in 1894 to acquire the Ajax Mine and adjoining leases at Kalgoorlie, and up to March 31 last the total production of gold has been worth £2,863,220, extracted from 1,037,000 short tons. The reserve of ore was estimated a year ago at 185,317 tons averaging just under 10 dwt. Since then the shareholders have suffered many rude shocks, as regards both the current extraction and the estimation of reserve ore. The directors have now to apologize for the failure of the method of sampling telluride mines at Kalgoorlie. During the first nine months of 1909, the monthly output of ore averaging 11,500 tons, had been yielding gold worth £21,000. In November the yield began to drop, and one of the directors, A. H. Collier, was sent out to investigate. The cause for the fall was attributed at the time by the manager, George M. Roberts, to difficulty with water in one of the shafts and a collapse of ground in one of the stopes. Mr. Collier confirmed what was told him, but his report also showed that this particular stope was yielding the best quality of ore, and that its collapse revealed the poverty of the ore at the back. Subsequently, Mr. Roberts estimates the reserve at 553,000 tons averaging 6¾ dwt., but on June 17, he withdrew this estimate by cable and reported that the ore sent to the mill contained only 6 dwt., adding that the outlook was discouraging. E. H. Liveing, the company's engineer, went at the end of May to investigate. His cable report says that the reserve ore is low-grade and pockety, and that the prospects at depth are discouraging; his detailed report is awaited with anxiety. During the year ended March 31, the mill treated 136,829 tons and produced gold worth £228,351, being an extraction of 33s. 4d. per ton. The mining cost was £54,489, milling and cyaniding £79,878, and other expenses brought the working cost to £141,596. In addition development cost £30,021, and there were other small items of receipt and expenditure. The dividend paid absorbed £49,536, being at the rate of 10% in the issued capital. Though £69,000 has been spent during the last few years in improvements in the metallurgical plant, Mr. Liveing advises a renewal of the roasting furnaces on different lines, as the old ones are worn out. At the shareholders' meeting, the directors' extra remuneration, £990, was vetoed, and Benjamin Brookman and Edward Hooper were elected to the board in place of the retiring directors B. C. Hinman and John Waddington.

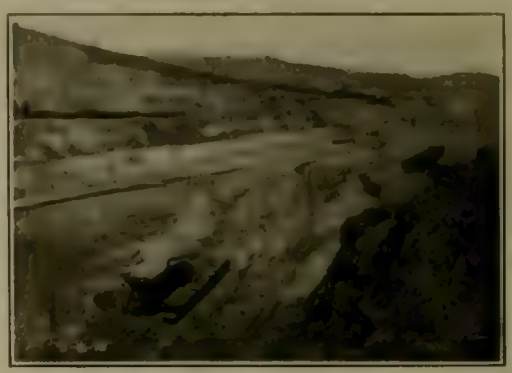
The Vivien Gold Mining Co. was formed in 1902, by Bewick, Moreing & Co., who are the managers, to acquire and develop a gold mine ten miles north of Lawlers, Western Australia. The issued capital is £76,000, and the equipment consists of 20 stamps and cyanide plant. No dividend has yet been paid. The upper part of the mine contains oxidized ore, down to the third level. On the fourth level, however, arsenical sulphide is found causing trouble in extraction. Developments recently have not kept pace with the extraction, 26,000 tons having been blocked as against 41,146 tons sent to the mill. The reserve on December 31 last was 35,219 tons, averaging over 6 dwt. An intermediate level has been driven between the third and fourth, approximately on the line separating the oxidized ore from the sulphide, and some useful ore has been found between this and the third. The ore treated during 1909 yielded by amalgamation and cyanidation, 10,625 oz. or 21s. 10d. per ton, bringing an income of £45,078. The expenditure on development, mining, and milling was £45,011. Expenses in London, depreciation, income tax, etc., brought the expenses to £47,419, so that there was an adverse balance of £2241. W. J. Loring, a member of the firm of Bewick, Moreing & Co., has recently paid a visit of inspection and reports that the plant is now treating the arsenical ore at a profit, though he is diffident in asserting definitely that the company is finally rid of its metallurgical troubles in this connection.

ELY, NEVADA

Nevada Consolidated Curtailment — Ely Calumet Lessees — Nevada Amalgamated.

For the past two weeks there has been a general curtailment in output by the Nevada Consolidated Copper Co. At the present time one unit of the concentrator is down and underground repairs, which cuts the production 25%. For the past month at least one section of the plant has been down all the time. The tonnage of ore now treated is at the rate of 6000 to 6,500 tons per day as against an average of 8000 to 9000 tons a month ago. A steam shovel arrived last week for the Nevada Consolidated which will be used later in opening the new steam shovel pit on the company's Liberty claim. For the present the shovel was put to work in the old pit, where there are six shovels in operation, two on ore and four engaged in the removal of overburden. Two other shovels will arrive in September, when the three machines will be put to work opening the new pit.

A discovery of unusual importance was made here last



Copper Flat from the Southeast, Ely, Nevada.

week by Strohelke brothers, who have a lease on Ely Calumet ground. Two men are now taking out from 12 to 15 tons of ore per day that will average at last 25%. The orebody appears to be 10 to 12 ft. wide, but not a sufficient amount of work has as yet been done to determine its extent. It occurs in an iron and limestone formation, the value minerals being bornite, carbonate, and red oxide, with some glance. The ore is being shipped to Salt Lake for treatment. Lessees on the Wildcat claim, owned by the same company, are taking out lead-silver ore averaging $70 per ton. At the present time they have a vein three feet wide which gives promise of developing into a good mine. A cash sale was made here today of the Gold Coin group of five claims adjoining the Giroux Consolidated holdings on the south for $20,000. The deed was made to Eugene Giles of Salt Lake, who is cashier of the Copper National Bank, and who is supposed to be buying the property for other parties, possibly the Giroux company. The Gold Coin group was owned by O. L. Terry, Raymond and Phil McKernan, Walter Schallenberger, and George Metzger, all of Ely.

E. L. Fletcher, who is the manager of the Tungsten property near Osceola, which was recently purchased of O. A. Turner, and which is rapidly being developed, returned last week from the East, where he purchased a plant for concentrating the ores, the product from which will be shipped East. Since arriving home Mr. Fletcher secured a bond on a group of tungsten claims at Tippet, in the eastern portion of this county for a consideration of $50,000. A force of miners has already been put to work developing the property. Reports from the Nevada Amalgamated at Blackhorse is to the effect that the new 10-stamp mill is rapidly approaching completion, and will be in operation in about two months. The mill will treat custom ores, which has had a stimulating effect in the development of gold properties in that district. A pumping plant has been ordered for the Zack shaft of the Ely Consolidated, which will be

installed within a couple of weeks, when the shaft will be sunk from the 400-ft. level. The company has developed a large body of 5 to 7% copper ore above the water-level, which will now be blocked out on lower levels. The Brilliant shaft of the same company will also be equipped with a pumping plant.

DENVER, COLORADO

Mining Congress. — Production. — Shortage of Silica Ores. — Changes in Speculation. — Will There be a Boom Next Spring?

The American Mining Congress, with headquarters in Denver, has recently organized a Colorado Chapter, and is urging the formation of local subsidiary associations among the miners in the principal districts of the State. The idea is that the latter are to be the fundamental organizations, and that the State Chapter should be composed of delegates from them. If there is a hearty response to this program, the work will be gradually extended into the rest of the mining States. Those who have, with much labor and persistence, and against considerable apathy on the part of even the mining public, kept the Congress alive during the last five years feel that, a bureau of mines having at last been secured, all who are interested in the business of mining should now get into position to back up the Congress in its efforts to obtain further results. D. W. Brunton has been elected president of the Colorado Chapter, A. W. Warwick, secretary, and E. A. Colburn, treasurer, while J. F. Callbreath, Jr., Max Boehmer, and A. L. Burris constitute the executive committee. Messrs. Warwick and Callbreath are now traveling around the State and organizing the local societies, and they report much interest among mining men. Primarily, the object is to secure financial support for the work of the Congress in Washington, but quite as strong a motive is to mass the moral backing of the mining districts behind the Congress in its demands for certain State and Federal legislation which is deemed of imperative importance. Among the things locally important may be mentioned enactments to properly punish the crimes known under the term of 'high grading', and an examination of the subject of district mine drainage, with the view of ultimately getting some law on the statute books which will compel absent or selfish owners to participate in the cost of unwatering certain basins known to be valuable, and yet at present inaccessible because of their divided ownership. In Federal matters, the Congress talks of endeavoring to secure some modifications of the rules and regulations recently issued by the Forest Service relating to prospecting in the National Forests, and certain fundamental changes in the National mining law. As might be expected, strong divergences of opinion on all these subjects have already developed, and it will take careful navigation to carry the organization safely past the Scylla of the extremists and the Charybdis of the indifferents. To an observer it looks as if some of the objectives—as, for example, the abolition of extralateral mining rights—have been posed merely to allow of their withdrawal later on, in the interest of harmony; and also that others, for the present kept carefully in the background, are to be pushed forward at favorable moments. This is perhaps the only way in which results can be obtained. There is a general feeling that up to date the Congress has justified its existense, and that it should be allowed further opportunities. At the basis of this friendly sentiment is a recognition of the fact that so far the organization has remained under the control of men of moderate views, but who have demonstrated both earnestness and ability, and that it will be safe to back them somewhat further.

Unusual activity characterizes almost every mining district in the State. Some of this is due to the recent improvement in the price of silver; some to the rapid advance toward completion of certain large enterprices (like the Cripple Creek drainage tunnel, for instance, which within the next thirty days will enter the mineral-bearing zone of the famous camp, and begin to draw off some of its waters), the importance of which are just becoming evident to onlookers in the commercial centres; some, perhaps, is more fancied than real; finally, some may be regarded as the reflex action due to a more vigorous exposition than usual on the part of the newspapers of the mining centres of the doings in their vicinity, as a protest against statements in some of the Denver papers, and remarks by an unwise and poorly posted official of the smelter interests to the effect that the industry has seen its best days and is on the decline. A glance over the July records from the principle districts shows that the daily output has not been less than 7000 tons, and was probably nearer 10,000. Such figures have deep meaning when examined, for it takes a good miner, working on a good sized face of ore, to break down three tons of ore per shift.

An interesting feature of the mining situation in the State is the impossibility at present of finding a sufficient market for the vast amount of sulphide ore which could be put out from Leadville and other camps. There are certainly several million tons of this class of material blocked out and available at small cost, and containing enough gold and silver to be payable under ordinary circumstances, if only a sufficient quantity of silicious ores could also be obtained by the smelters. Before the days of milling in Cripple Creek the pinching shoe was on the other foot, and low-grade sulphides were in high favor and demand. A new district yielding $20 to $40 ore in a gangue of pure quartz is badly needed. As it is, the smelters are going as far as Cobalt in Canada for their silica, and not getting anything like as must as they could use advantageously, even there.

As an index of sentiment among promoters and brokers in Colorado Springs and Denver, it is worthy of note that several have completely withdrawn from the mining field, and are pushing irrigation and immigration schemes of more or less merit. This simply means that these people, who bring a good deal of money into Western circulation, consider that the Eastern investor has become tired of mines for a while, and may be more easily influenced to take up other forms of speculation. There is a time for everything, and the present is not the time for a flood of new mining promotions. So the Exchanges are a little dull, and the brokers who have not changed their menu cards to suit the prevailing fashions are kicking their heels against the curbs and praying for a shift of the wind. It will come in due time. One has only to be patient. In high regions like those of the Colorado mining districts, the prospector has to suspend operations early in November at the latest, and cannot get into action again before June. The winters are usually devoted to working for wages, and when summer at last arrives, and the *wanderlust* comes upon him, he goes forth fairly raging. By the middle of July the public begins to hear from him. About that date the Denver papers bristle with tales of new finds, new districts, new kinds of mineral. As these are the dog days in the valley towns, all such items are most welcome, and are worked up with enthusiasm by the reporters. The fever lasts till the warm spell is over in the city, about August 15, by which date other interests come to the front, and the miner and his doings recede to a less prominent position in the public eye, while the farmer with his marvelous crops begins to draw the attention. His public season is somewhat longer than that of the miner, for his produce does not mature all at once. But by the first or middle of October he also passes into eclipse, while the real-estate man comes into his own again, and holds the prominent place on the stage until well into the following spring. And thus it goes from year to year, the actual producers of new wealth getting but a brief benefit of applause from the unthinking multitude. However, every now and then these real workers and developers do get a 'special,' particularly the miner, and then how things do hum, and how the traders in corner lots do hustle up the gulches to get in as nearly as possible on the ground floor of the new finds, and how the miner does get even. One has to be an onlooker for two or three decades in this little game to understand all the fun that goes on. There are some indications that the work of the prospector in Colorado this season may bring in one of the miner's 'special' years.

WALLACE, IDAHO

Success Mine — Gold Hunter Mining & Smelting Company

The Success mine, the most important producer in the Coeur d'Alene, yields ore which averages 5% zinc and 5% lead with some silver, accompanying the lead. Approximately 150 tons per day is mined and concentrated, the mill work resulting in a fairly clean separation of the zinc and lead. The zinc concentrate contains 4 to 5 oz. of silver per ton, and this is shipped to Cleveland, Ohio. The lead concentrate contains 50 to 60% galena and 10 oz. silver per ton. A day's mill run of 150 tons of ore results in about 30 tons of zinc and 2 tons of lead concentrate. Both products are low in iron. The mill work offers a good example of careful crushing, sizing and thorough classification for concentration and separation by jigs and tables. The gangue consists of quartzite, which readily separates from the metals and the fact that the percentage of iron is low, makes it possible to produce tolerably clean zinc and galena concentrates. The mill is operated by water power, supplemented by electricity. The mine and mill are 4½ miles north of Wallace, on the north fork of Nine Mile creek. The orebodies occur in a north and south zone of quartzite, the latter lying between bodies of monzonite. There are, apparently, two parallel veins from 15 to 40 ft. apart, and these follow the strike of the quartzite, also one or more veins which cut transversely the other two. Especially strong shoots of ore occur where these laterals cross the principal veins. The mine is operated through crosscuts No. 2 and 3, the latter having a vertical distance of 148 ft. below the former. No. 2 cuts the ore 400 ft. from the portal, and No. 3 reaches the orebodies at a distance of 1200 ft. Several hundred feet of driving has been done on the two parallel veins off both No. 2 and 3 crosscuts, which discloses bodies of ore ranging in width from 3 to 30 feet.

The greatest work going on now is on an intermediate level 100 ft. below No. 2, where a number of Waugh drills are in use in the stopes. Levels have been opened at every 100 ft. between the two, connected with No. 2 and 3 crosscuts. All ore taken out of the higher levels is passed through chutes to a connection with No. 3, through which it is hauled to the mill. The two parallel veins, first opened on and above No. 2, are in evidence at other levels on which considerable work has been done. They have a dip west of about 70°. The cross veins have been opened for some distance, but not as yet to the contact of the quartzite and monzonite. The zinc and lead are not uniformly associated; in some parts of the mine the bodies of zincblende appear to contain but little lead, though there is often a streak of high-grade galena next to the zinc ore. Especially in the higher levels the zinc greatly predominates, but on the lower levels the proportion of lead seems to have increased. It is an easy matter to obtain here specimens which will assay over 60% zinc, and others which contain about 80% lead, but the general averages given above are on the authority of H. F. Samuels, president and manager for the Success Mining Co., and are based on milling and shipping records. Samuel Linn, under whose charge most of the development has been done, is superintendent. The mill work is in the hands of Charles Samuels.

The Gold Hunter Mining & Smelting Co., operating the Gold Hunter mine at Mullan, is concentrating 200 tons per day of ore that assays 8% lead and 12 oz. silver, and as the mine is so developed as to be able to produce a much greater tonnage, the capacity of the mill is to be increased. All ore now produced is taken from levels above the main haulage adit, which is in 4700 ft. At the 4500-ft. point on this adit a winze has been sunk 200 ft. on the orebody, showing at that depth high-grade galena. The purpose now is to install an electric hoist at the collar of the winze and continue sinking till a depth of 1000 ft. shall have been reached. This adit, known as No. 6, crosscuts the vein 1500 ft. below the surface. P. J. Hennessy, Thomas F. Keeley, J. R. McCormack, and Dennis Ryan comprise the officers of the company, Mr. Ryan being manager.

NEW YORK

Coppers — Consolidated Arizona — Tonopah Belmont Market — Cobalt Stocks — Granby.

The copper situation excites the greatest interest in the financial districts. The biggest pools that ever got into Wall Street came into coppers during the past five weeks, attracted in part by the stamp of the powerful names connected with the industry, in part by the element of safety in the big properties with immense orebodies and an assured long life, and in part more recently by the general impression that there was to be or is to be something done in copper in the way of large market plans. It is hard to draw anything from any of those who can speak with knowledge concerning the present or future plans of the producers. There is an obvious lack of free speech amounting to almost total paralysis of the vocal organs, in regard to both curtailment plans and understandings as to future mergers. The producers are finding it hard to carry water on both shoulders, to give the impression that there is a complete understanding as to restriction of output, and at the same time, keep clear of any legal difficulties. Butte is emphatic in its denial of curtailment except in so far as is necessary to avoid swamping the smelters. The Guggenheim interests publicly announce orders to curtail 15%, with the additional statement that it is done wholly on their own initiative. The general public has consequently been very much at sea and, while more than anxious to lend support to the copper share list, has been without a sufficient market guide. The trading in the securities listed upon the New York exchange has been featureless. Some two or three weeks ago the Pearson syndicate, which suffered financial embarrassment, was first relieved of extra burden in the way of securities carried and then saved from complete failure. As might have been expected there has since been made an eight to fifteen point rally in the stock market obviously that the Pearson securities might be distributed. Even so sharp an advance has failed to secure the attention of the public, in most part, because the market is leaderless. There are issues in which there is much trading; Steel, Amalgamated, Reading, and the Harriman stocks; in all of these there are known to be large pools operating and so far controlling the market as to render any study of conditions on the part of the public futile. It is impossible to say whether those factors in the production of copper, who were in conference last winter in the attempt to frame a copper combination, were charmed with the possibilities of the scheme or were awed by the immensity of the undertaking. There is no question, however, as to the hold which the copper merger has upon the imagination of the people at large: a new market leader, another United States Steel, to dominate and regulate an industry that is growing and breaking all records. The fascination of the copper merger idea was demonstrated, during the current week, by the marked attention and the amount of front page space given to a London cable, which placed Thomas F. Ryan, and Samuel Untermeyer, in the Hotel Ritz, in London, where, with a few copper magnates, they were building a $200,000,000 copper trust, which was immediately to raise copper prices all over the world. The story was ridiculous upon its face. T. F. Ryan is the whole power-house of New York city's transportation lines, surface, subway, and elevated, but he is not in copper at all as far as known. John D. Ryan, the diplomat of the copper world, has just returned to New York and was preparing to go to Utah to examine the new smelter at Tooele. Obviously a copper trust could hardly be projected without John D. Ryan—to speak for the Anaconda and the chain of coppers known as Cole-Ryan properties, nevertheless the story was so far credited as to be generally announced as the culmination of the months of negotiation by the copper producers. The story was plainly a canard and wholly unimportant, save that it demonstrated the wonderful general interest in copper and the universal desire to see created a new leader in the market. It is altogether conservative to say that nothing could receive such cordial unanimous market support as would a copper merger auspiciously

launched and especially if fathered by Mr. Morgan, who is held to be by far our greatest constructive financier. There are many ambitious plans, the copper combination among others, that are to wait until the Supreme Court shall pass judgment upon the Standard Oil Co. and the Tobacco Trust. In the meantime, however, there are many preliminary steps that like the Anaconda deal, are being completed in preparation. The Miami is to absorb the New Keystone and possibly the Inspiration, in the near future. The Miami and the Inspiration are physically all one property, and sooner or later will undoubtedly be brought under one management. As between the two there has always been a little argument as to which was the major part of the whole. Miami is the pride of the General Development Co.; the Inspiration is controlled by the Gunn-Thompson interests, W. B. Thompson being the market maker and the financial end of this combination, which was heavily interested in Nipissing and La Rose of Cobalt, prominent also in the original flotation of Cumberland Ely and now developing the Mason Valley, which is just erecting a smelter at Yerington, Nevada. Inspiration moved up sharply on the New York Curb this week. On the strength of the favorable developments at the property, Miami 'rights' have reached the market place and are being traded in around 20c., which is equivalent to $20 per share for the stock.

Consolidated Arizona, at one time Lawsonized but now in the hands of New York interests marketwise, has been the medium of an increased volume of speculation recently, largely due to industrious tipster work, but in part to the fact that the plant is producing some result now, the reverberatories being tapped this week for the first time. The plant is at Humboldt, Arizona, and should do a good custom business handling the ores of the Yavapai county mines.

The spectacular feature of the week was a drive at Tonopah Belmont. The news that the big Belmont vein had faulted on the 1100-ft. level, some 638 ft. in on the drift, precipitated a flood of selling that broke the market nearly a whole point. It is not believed here that the faulting is of sufficient importance or portent to justify any such bear attack, but the news was used for market ammunition and its possibilities greatly exaggerated. The vein will undoubtedly be picked up without great trouble. Belmont's July earning of $140,000 as compared with that of the Tonopah Mining company of $170,000 gave promise that Belmont might within a short time take place as the leading producer in Tonopah.

Kerr Lake is at present a patent illustration of the Cobalt paradox. The company holds the record for the production of cheap silver in Cobalt. Monthly cost sheets have occasionally shown a figure below 10c. per oz. It will pay a third quarterly dividend of 50c. per share in September and will have paid in 1910, $900,000. There have been some disquieting rumors of the bottoming of some of the veins, which are specifically denied by the management. Kerr Lake has a surplus of more than a million dollars and has assured three times that amount net in the mine, which is about as much of a showing as any Cobalt property can make as it is impossible profitably to block out any large orebodies at Cobalt. Yet, under selling pressure the issue, one of the largest dividend payers in the mining list, seems to be without inside or outside support. The Temiskaming Mining Co. is a second illustration. This property showed a deficit of $97,000 at the close of last year. The first six months of the current year wiped out the deficit and accumulated a surplus of $179,496. The showing of real profits in real money had little or no effect upon the market.

The recent so-called cave-in at the Granby property is explained by Jay P. Graves, the president, as being not at all a serious matter, in fact a part of the mining system employed at the Granby. Instead of following the old method of timbering, a plan has been worked out by the Granby engineers, whereby large ore-pillars are left standing to support the roof and floor levels as work advances. When all of the ore above is extracted, these pillars are shot down and the roof or floor above falls and the ore contained is shipped. Frequently these floors or roofs are permitted to stand for some time after the bulk of the ore has been extracted before being shot down; often when a large percentage of the ore is extracted from a given stope, that part of the mine is closed and permitted either to fall, as was the case in the instance referred to, or is shot down at a later date when a large amount of ore is needed for extraction. Mr. Graves states that this plan has worked satisfactorily, is very economical, and has proved perfectly safe to miners and owners.

The directors of the Calumet & Hecla Mining Co. have elected Rudolph L. Agassiz vice-president to fill the vacancy made by the resignation of Thomas L. Livermore. Mr. Livermore presided at the stockholders' meeting just preceding that of the directors, his doing so being his last official act after twenty-one years of service with the company.

LOS ANGELES, CALIFORNIA

Oil Operators Meet. — Midway Gushers. — Power at Kingman.

The meeting held here on the evening of August 18, for for the purpose of discussing conservation and its effect on the oil industry of California, was attended by about 75 operators. Two committees were appointed, one on organization of a permanent body and another on resolutions. It will be the duty of the latter to formulate resolutions for presentation at a meeting to be held here on the evening of August 25. A large delegation from San Francisco is expected at this meeting. It is the purpose of the organization to prepare a set of resolutions that will embody the views of the oil operators of the State, and present them at the forthcoming meeting of the American Mining Congress. Obviously, the operators are not of one mind on the question of conservation, for there are certain policies that would be favorable to some and possibly disastrous to the interests of others. Already there has been discussion among those who differ with some of the ideas advanced regarding conservation.

After sanding on August 9 and giving some little trouble, well No. 79 of the American Oilfields, in the Midway field, has started flowing with renewed energy. Up to August 21 the official report was that the well had gradually increased to 25,000 bbl. per day, at times flowing at the rate of 50,000 bbl. per day. This output is slightly in excess of that of the Lakeview gusher, which is reported to be flowing between 20,000 and 22,000 bbl. Well No. 68 of the American Oilfields, about 1200 ft. northeast of No. 79, was brought in about ten days ago and from last reports was flowing at the rate of 6000 bbl. per day. The well is making a great amount of sand and officials of the company predict another gusher. The Combination-Midway brought in a strong gas well during the week. The blow-out occurred at 1800 ft., after the drilling had been in blue clay for a depth of 800 ft. The crown block and upper part of the derrick were blown a great distance and much other damage was caused.

Officials of the Desert Water & Power Co., operating at Kingman, Arizona, state that the Gold Road and Tom Reed mines have increased their demand for electric power. These mines, situated 25 and 27 miles respectively, from Kingman, have been using 700 hp. and within 60 days will be consuming 1000. The Hercules mine is almost ready to connect its power line. The power company has ordered machinery enough to double its present capacity, in anticipation of a growing demand for electric power in the vicinity of Kingman. The Young Construction Co. of this city will begin immediately the remodeling of the old stamp-mill on the property of the Ruth Gold Mines Co. This property, situated near the Gold Road mine, was recently acquired by a group of capitalists from the South. The capacity of the mill will be increased and a cyanide plant added. The Young company has charge also of the remodeling of the 100-stamp mill and cyanide plant of the United Mines Co., operating at Ogleby, California. This property was formerly known as the Golden Cross mine.

General Mining News

ARIZONA

GILA COUNTY

(Special Correspondence.)—Expectations of ore to be revealed by the cross-cut south from the 300 ft. level of the Telfair shaft to the Old Dominion fault at the Arizona Michigan property have been somewhat nullified by virtue of the fact that the cross-cut has been or is supposed to have been in the vein for the past week. At a point 1130 ft. from the shaft the formation changed abruptly. The calcareous shale ended and the formation assumed the semblance of iron stained vein matter. At the point where the change took place there was no revelation of anything that suggested a wall and it is doubtful if the cross-cut is even in the Old Dominion fault. If this is the condition the Arizona Michigan people still have an unexploited vein directly ahead of them and the continuation of cross-cutting may reveal copper in the near future. Various conflicting and recurring reports are prevalent as to the state of Arizona Commercial as far as ore in sight is concerned. Reports to the effect that ore of great quantities and richness has been revealed by the diamond drilling on the 7th level have appeared in the Eastern financial papers along with some encouraging articles dated from Globe and emanating from an unknown source. It is to be hoped that these reports can be relied upon and that the Arizona Commercial can find its way clear to open the smelter inside of 60 to 90 days. Local rumor, however, has added nothing to the details that the diamond drilling had been discontinued and that the underground force had been laid off. A contract has just been let for the sinking of the Eureka shaft at $80 per foot, and good progress in that direction should be made.——Development is still being carried on in the McGaw shaft at the Superior & Boston property, the weekly progress amounting to something like 20 ft., and the depth to date being in the neighborhood of 825 ft. from the collar of the shaft. The formation in the bottom of the shaft is a badly shattered and somewhat silicious limestone, and the nature of the rock has allowed of the circulation of ground water to the extent that there has been quite extensive mineralization. The rock is heavily iron stained and in places assays well in copper.

Globe, August 22.

MOHAVE COUNTY

The concrete work on the foundation for the new cross compound engine that is to form the new unit of the power plant at Kingman, is well under way and the machinery will soon be on the ground. When the extra unit is completed power will be supplied to many of the mines in the districts surrounding Kingman, thus reducing the cost of development.——The force at the Enterprise mine has been increased by W. A. Mensch and considerable development is planned. The owners are figuring on erecting a mill this fall.——The assembling of the machinery at the Gold Crown mine is going forward rapidly and a number of teams are kept busy hauling the parts from the Union depot.——It is reported that the Needles Mining & Smelting Co. has opened the Tennessee vein at a depth of 200 ft. and that the old works will be unwatered to that level at once.

PIMA COUNTY

The Copper Queen Consolidated Mining Co. has purchased the Geesman, Leatherwood, and Billie Reed properties in the Santa Catalina mountains for $135,000. It is also reported that the Copper Queen company has taken over the property of the Imperial Copper Co., at Silverbell, and that the recent shut-down was for the purpose of appraising the company's holdings.

YUMA COUNTY

The Clara Consolidated Gold & Copper Mining Co. has purchased the old Mudespaugh mines, about eleven miles south of Bouse, for $250,000. The ore is a copper-silver sulphide with a small amount of gold and is said to make an excellent flux for the Clara product.

CALIFORNIA

AMADOR COUNTY

The Kennedy Gold Mining Co. is again sinking the shaft having passed the [illegible] point. The Bunker Hill Mining Co. at Amador City is to add 20 stamps to its mill.

CALAVERAS COUNTY

The Oriel mine in the Mokelumne district has been bonded and work is to be started in a short time. It is

Kennedy 100-Stamp Mill.

reported that the Easy Bird mine which has been idle a short time is to resume operations.——C. O. and W. R. Womble, who have a bond on the North Star mine at West Point, have retimbered the main shaft and are sinking on the vein which is 30 in. wide and contains a high percentage of sulphides. Thompson & Smith are sinking a new shaft on the main shoot of the Bouvard Extension. A. R. Wilson has secured a bond on the Champion mine.——The Newman mine and mill have been closed down on account of the lack of water.——The air shaft which Young & Chapman are sinking on the Alaska mine is down 40 feet.

HUMBOLDT COUNTY

(Special Correspondence.)—The California Mining & Dredging Syndicate, operating at Orleans, on the Klamath river, with about 1500 acres of patented land, has just closed a successful hydraulic season. The water fell below 600 in. at the mine early in this month, and the management concluded to shut down the giants and put the flumes and ditches in order for the coming season's operations. The county wagon road is now within eight miles of the mine and the completion to Orleans is expected early next year; this will enable the building of a dredge at Orleans to work the low flat and river-bars. The Syndicate has added to the saw-mills and generally improved the property during the past two years in anticipation of completion of this road enabling dredge installation. H. DeC. Richards is general manager.

Orleans, August 22.

INYO COUNTY

The Gray Butte mine west of Benton has resumed operations and the deep adit will be driven ahead to cut the veins at depth.——A. J. McCone and associates have taken up their option on the Reward mine, southeast of Independence, and it is reported that work will be resumed in a short time.

NEVADA COUNTY

The company operating the Birchville mine in the Graniteville district, the plant of which was destroyed by fire a short time ago, is to rebuild shortly installing electric machinery to replace the old steam and water-power plant. The installation of electric apparatus will do away with many troubles previously met on account of the water in the ditches and pipes freezing.——C. M. Root, superintendent of the Gladstone, Sierra Madre, and Acme properties, has added several men to the working force, and it is expected that the shoot will be tapped in a short distance as numerous rich stringers are being found in the quartz.

SHASTA COUNTY

(Special Correspondence).—At the Little Nellie mine which joins the properties of the Mountain Copper Co. in

the Iron Mountain district, a new Sullivan 2-stage, 6-drill compressor, 50 hp. General Electric motor, and Sullivan drills have been installed, making a total of six drills now operating in the mine. The lower drift has been driven over 2460 ft. on the vein opening three shoots, the last of which has been driven on for 320 ft., the ore showing as good in the face as at the beginning of the shoot. This drift gives the company 360 ft. of backs on the vein which is 1 to 5 ft. in width and on which 12 stopes have been opened. Ore-bins have been erected on the Iron Mountain railroad and the ore which nets the company $13 per ton is being forwarded to the Mountain Copper Co.'s smelter at Martinez. Fifty cars of this ore which is probably the only quartz ore being shipped in Shasta county at this time, was forwarded recently and the company expects to continue shipping at the rate of 1000 tons per month. Since last November enough ore has been shipped to pay all expenses of mining and development. A. B. McVey is superintendent, and J. F. Partington foreman.——E. O. Lindblom, who has held a lease on the Milkmaid group at French Gulch, has given up his option on the property as the mine has been worked out.

Redding, August 23.

SIERRA COUNTY

(Special Correspondence).—The sub-station of the Middle Yuba Hydro-Electric Co. is nearing completion on Smith's flat, near Alleghany. The transformers are being installed and it is expected to commence the delivery of electric power to the mines early in October.——The drift from the lower adit of the Tightner is approximately 120 ft. from the ore-shoot opened in the winze from the upper adit. The drift has followed the vein for over 150 ft. with free gold and sulphides showing the greater portion of the way. A lot of 125 lb. of ore, valued at $2000, was recently taken from a point below the main shoot.——The Twenty-One recently intersected the contact and the vein broadened to a width of 8 to 10 ft. The shoot is three feet wide and consists mostly of ribbon quartz with considerable sulphide. The adit is progressing steadily.——The Bear Creek mill is shipping bullion regularly. Steam power has been introduced. ——An air-compressor is to be installed at the Lookout where a 20-ft. vein is being opened.——Fifteen men are working at the Phoenix and the mill will be put in operation as soon as the flume has been completed. Six feet of milling ore has been opened in the old workings and it is planned to drive a lower adit from 1600 to 1800 ft. to tap the vein at depth.——It is rumored that work will be shortly resumed at the Four Hills.——The mill at the Swastika has been practically completed.

Alleghany, August 22.

TRINITY COUNTY

(Special Correspondence).—The Adams Exploration Co., which owns a group of claims half a mile north of Carrville, has opened a vein of high-grade free-milling gold ore and will prepare for the installation of a Huntington mill and the erection of a bunkhouse for the men.——The Golden Eagle Mine and Development Co. of Vallejo, has taken a bond on the Iron Dyke group, south of Carrville, for $100,000, and one on the Forget-Me-Not group, one mile east, for $5000. Both groups are the property of Mrs. George Carr.

Carrville, August 22.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence).—A deal has practically been closed whereby the American Sisters mine and Princess of India adit on Columbia mountain, will be turned over to M. W. Mouat, representing a syndicate of New York capitalists. The consideration is said to be $150,000. J. J. White, one of the heavy stockholders in the property, is now in New York completing arrangements.——Work was resumed this week upon the Sunburst Extension property on Democrat mountain. It is proposed to continue the adit to intersect the series of veins owned by A. Robert.——A shipment of four tons of ore made last week from the Anglo-Saxon mine on Saxon mountain assayed 2 oz. gold and 35 oz. silver per ton.——It is stated that seven carloads of machinery should arrive in Georgetown any day for the Western Metals Co., constructing the Malm electro-chemical mill. The equipment was started three weeks ago from Schenectady. From a statement made by W. E. Malm the plant will be ready to start ore treatment within 60 days.——A body of ore 6 ft. wide that assays 2 oz. gold per ton, has been opened in the Oneida mine at Freeland. The discovery was made through the Lamartine adit-level.

Georgetown, August 20.

GILPIN COUNTY

(Special Correspondence).—A contract has been awarded McFarlane & Co. of this place for the erection of a 250-ton concentrating plant to handle ore from the mines of the Frontenac Consolidated Mining Co. Power will be supplied by the United Hydro Power & Electric Co. of Georgetown. ——Four tons of ore were shipped last week from the War Dance mine that milled 10 oz. gold and 4.55 oz. silver per ton.——Work is to be resumed on the National mine on Quartz hill by D. McKay and associates.——A clean-up of 60 tons of ore from the Egyptian mine brought a settlement of 1.40 oz. gold and 12 oz. silver per ton. The first-class ore varies in value from $85 to $130 per ton.——W. L. Shull resumed work last week on the Hall mine in Russell district.——The boilers at the Brooklyn mine have been fired and water is being lifted from the shaft.——A shipment of 250 tons of ore is now being made from the Rockford mine to the Iron City mill. S. Harris is manager.

Central City, August 19.

LAKE COUNTY

The adit being driven into St. Kevin mountain by the Gleason Gulch Mining Co., to cut the President, Amity, Birdella, Iron Hat, and other veins, is making excellent progress, being in nearly 800 ft. A number of rich stringers have been cut and it is expected that the work will be finished within the next 300 ft.——The lessees of the Matchless claim of Fryer hill are shipping 40 tons of carbonate ore per day.——The lower drifts at the Homestake have been cleaned out and two shifts are working at the face.—— The territory east of the Silver Cord ore-shoot is being prospected from the Yak tunnel with excellent results. A winze has been sunk 600 ft. from the tunnel-level and an orebody cross-cut that assays $50 per ton.——A drift has been driven 200 ft. on the vein that was recently opened in the New Monarch property showing it to average 14 in. wide and assay $40 per ton.

OURAY COUNTY

A body of copper-silver ore that assays 600 to 700 oz. silver per ton has been opened by the 80-ft. raise from the Koler adit-level on the Carbon Lake claim of the San Antonio company. It is thought that this shoot extends to the 200-ft. level, giving the company 300 ft. of backs.—— Sinking has been resumed in the Legal Tender shaft, south of Ouray.

SAN JUAN COUNTY

(Special Correspondence).—Two important discoveries have been made in this county in the past few days. A splendid body of stromeyerite, gray copper ore, has been opened on the Kansas City group in Georgia gulch. The ore is rich in silver assaying from 150 to 800 oz. Where the vein was cut it displayed chalcopyrite and driving 35 ft. to the south the high-grade ore was opened which has gradually spread out until at the present writing it is three feet wide. Twenty tons have been taken out and is being loaded at the Henrietta switch of the Silverton Gladstone railroad. The group is owned by Walker & Russ who have worked it for the past two years.——The Hamlet mine has cut the Hamlet vein on the sixth level just above the mill in the Animas valley. This gives stoping ground 1300 ft. in height. At the point cut the vein exposed was a chalcopyrite-galena ore containing 12% copper and 40 oz. silver.

Silverton, August 19.

TELLER COUNTY

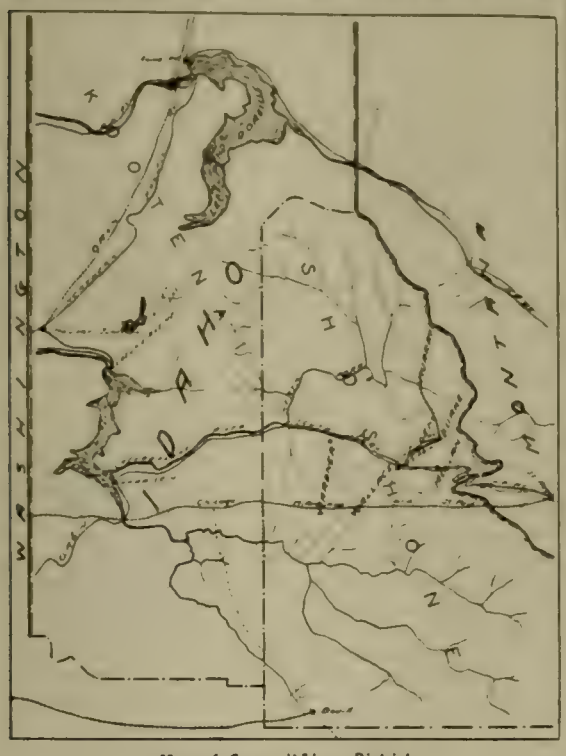
William Roe and associates operating a block on the 500-ft. level of the Ajax mine in the Cripple Creek district,

have uncovered a vein that assays $20 to $40 per ton. Experts have completed the examination of the Ophir mine on Raven hill for the Western Investment Co. and a long lease has been secured on the ground. The main Davenport shaft of the Doctor Jack Pot is being repaired and will be sunk from the 200 to the 900 ft. level. One of the largest orebodies found in the district is being opened on the 1700-ft. level of the Blue Bird mine and ore that contains a high percentage of sylvanite shipped.

IDAHO

SHOSHONE COUNTY

(Special Correspondence.) During the last half of July and through August the destruction wrought by forest fires in many parts of the Northwest has been as great as it has been regrettable. The fact that practically no rain has fallen in this district within the last ten weeks has rendered the grass and other undergrowth in the timbered areas dry and inflammable, and fires, started by accident and carelessness, have spread with fierce rapidity, catching in the smaller trees and drooping branches of the larger ones, which in a strong wind became beyond human control. The greatest havoc has been in Shoshone and Kootenai counties, Idaho, Stevens and Ferry counties,



Map of Coeur d'Alene District.

Washington, and that portion of British Columbia in which Kaslo, Sandon, and Nelson are situated. The loss is not only measured in square miles of timber, and ranch and mine property, but in human lives. Besides the aid rendered by the forces in charge of the Forest Service, the employees of mining companies and persons of all occupations have joined in efforts to save life and property. In many cases mine buildings and ranch houses have been successfully shielded by reason of the small clearing around them, but all efforts to check a raging fire in a thick forest has been unavailing. At this writing there are no indications of rain, the sun is dimmed by a pall of smoke, and the fires still continue in many places. A portion of Wallace has been destroyed and Burke and Mullan are in grave danger.

Wallace, August 22.

KANSAS

CHEROKEE COUNTY

(Special Correspondence).—The United Zinc Co. has leased of S. A. Stocker a lease of 20 acres in the Lehigh camp and has installed two pumps, one a centrifugal, and the other a 5-in. steam pump and have the water lowered to 120 ft. Since day operations were conducted power 100 ft. but a better grade of ore is found at 120 ft. The ground requires little timbering. Rich lead pockets were also frequently found in the past even above the 100-ft. level.——The Homestake mine has sunk a former shaft to a greater depth and as a result has reached a deposit of zinc ore in addition to the galena which was formerly mined. The new deposit runs 20% ore. At the present operations are confined to two hand jigs, but a plant will be built later if the prospect continues as good as it promises.——The latest company operating in the Cave Springs camp is the Hello company, recently organized with a lease of 20 acres upon the Schmuck land where a number of drill holes have cut ore in both shallow and deep deposits. A shaft is now being sunk to open the upper levels while the deeper deposits will probably be opened later.——In the same camp the Cave Springs company is making a large turn-in from hand jigs, making a carload of concentrate per week. The ore is found at the 80-ft. level, and much is so free that little treatment is required. A large dump pile is also accumulating to await a mill.——A. O. Ihlsing has sold the greater part of his interest in the Eureka mine and will henceforth devote his time to the development of leases on the Murphy and East Empire tracts where a tailing mill is being put up to handle the tailing from the Brindle Steer, the Jack Tanner, Henry C., and other old mines.——The Eureka mine was taken over by Robert Ping, who, in a recent prospect drift to the northward, opened the best ore so far found. The large new mill has not yet been run steadily as the company has met with trouble in the pumping apparatus.——The new mill at the Diplomat company has been completed and has now made its trial run with great success.

Galena, August 20.

MONTANA

BROADWATER COUNTY

(Special Correspondence).—The Custer group of mines, two miles from Winston, which have been active, are temporarily idle by reason of litigation involving one of the claims. C. S. Muffly, the principal owner, states that he anticipates the resumption of mining and shipping this fall. There are two veins, the Custer and Hyantha. The former is opened by a 600-ft. vertical shaft and six levels. The latter has a 300-ft. shaft and two levels. The veins are in diorite, and the ore contains galena, iron sulphide, and gold.

Winston, August 20.

JEFFERSON COUNTY

(Special Correspondence).—The Boston & Corbin Copper & Silver Mining Co. has the Bertha group at Corbin well developed through a 900-ft. shaft. A Wellman-Seaver-Morgan electric hoist and a 15 drill Ingersoll-Rand air compressor were installed some time ago. Driving is in progress on the Bertha vein from the 700-ft. station, the ore being partly a chalcopyrite. Some tests are being made with the view to erecting a concentrating plant if results shall indicate that it is warranted. H. E. Emerson is manager. The president of the company is N. L. Amster, who is largely concerned in the Shannon at Clifton, and the Arizona Commercial mine at Globe.——The Elkhorn, a silver-lead mine at Elkhorn, is operating with a good force and is running a mill.

Corbin, August 19.

LEWIS AND CLARK COUNTY

(Special Correspondence). In the Marysville district the mill at the Bald Mountain mine has been temporarily closed, pending further development in the mine. Thomas Cruse, the owner, has bought the Belmont, which is being further developed.——Frank Laughlin and Mrs. Matt Dougherty are shipping ore from the Honeycomb mine which assays $40 per ton in gold. This ore is taken from the mine dump.

Marysville, August 20.

NEVADA

ESMERALDA COUNTY

New work in the old Reilly stope in the Florence mine at Goldfield, is opening a large body of rich ore. The report submitted by the company to the State bullion and tax officials for the quarter ended June 3, showed that the company has mined and milled 13,252 tons of ore during that period, the average being $11.85. The cost per ton, including depreciation and administration charges, amounted to $9.85.——The report of the Goldfield Consolidated, filed with the State officials for the quarter ended June 30, showed that 36,826 tons had been treated, the average extraction being $75.74, the cost per ton being $28.39.——An orebody assaying 10% copper and $50 gold per ton has been cut on the 250-ft. level on the Spearfish claim at Goldfield. The ore is iron sulphide with black oxide of copper.

NYE COUNTY

(Special Correspondence).—The east drift on the 1100-ft. level of Belmont exposes a vein 12 to 16 ft. wide. It has been followed for about 700 ft. the ore being of excellent grade. On the 1166-ft. level the drift is opening 6 ft. of high-grade ore on the hanging wall.——At the Tonopah of Nevada diamond-drilling is progressing from the 1500-ft. point, while extensive developments are under way above the 700-ft. level. The company has entered into a new agreement with the Nevada-California Power Co. for the furnishing of electric power to the Tonopah mines and Millers plant for 10 years.——The drill hole at the MacNamara is 175 ft. below the 800-ft. level and going down rapidly.——At the West End developments are concentrated at the 275 and 400-ft. levels. Driving has been commenced to intersect a rich vein which strikes into West End from the MacNamara.——The Tonopah Extension reports improved conditions in the lower workings. The company is shipping 840 tons of ore per week.

Tonopah, August 20.

WHITE PINE COUNTY

Payment of bullion tax for the quarter ended June 30 this year has been made by the Nevada Consolidated Copper Co. to the assessor. The tax amounted to $7706.24 and was on an assessment of net profits for the three months amounting to $428,124.47 which accrued to the company from a total production of 696,045 tons of ore from which the value of the metals extracted amounted to $2,134,114.21. Five other mining properties in the county produced during the quarter 4204 tons of ore which were reported to the assessor at a valuation of $20,037.19 on which no tax accrued, making the total valuation of the mineral output for the period, $2,154,151.40. Next to the Nevada Consolidated the largest producing company was the Glasgow & Western Exploration Co., owner of the Star mine on Cherry creek. The amount of ore produced was 3892 tons worth $14,706, principally in silver.

UTAH

JUAB COUNTY

A contract has been let to Ralph Kellogg and Sam Scott to sink the shaft at the Yankee Consolidated from the 500 to the 900-ft. level, electric sinking equipment having just been installed. At this time six sets of lessees are operating in the old workings of the mine and are all reported to be doing well.——The North Iron Blossom Iron Co. has been incorporated to develop a group of 11 claims in the north Tintic district adjoining the old Beck iron mine.——A body of ore has been opened on the 300-ft. level of the Colorado mine 50 ft. below the body from which the main production has been made the last few years, and 350 ft. from the Sioux Consolidated line.——It is reported that the Gold Chain has opened a body of ore on the 300-ft. level though not enough exploration has been done to determine the size of the shoot. On the 400-ft. level a drift has been started to intersect the same vein.——A diamond-drill has been installed on the 1000-ft. level of the Tintic Standard and the lower levels of the property will be thoroughly prospected.

SALT LAKE COUNTY

Colin McIntosh, manager for the Ohio Copper Co., is authority for the statement that F. A. Heinze has been successful in raising the necessary money for the completion of the concentrator at Lark, and that a statement will soon be made to the stockholders of the company with an outline of the work.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—The Cliff mine at this place is being developed on a small scale under the supervision of W. Y. Williams, consulting engineer for the Granby Consolidated company. This mine has one of the finest showings of copper-gold ore in the camp and would easily be working now but the Spokane owners have always held it at a high price and would not lease. Operations at the Granby mines were interrupted during the past week by a fire which broke out in the oil-house and burnt the No. 3 crusher building and machine shops. Repairs are being rushed with all haste, however, so that shipments may be resumed as soon as possible, to avoid blowing out any of the furnaces at the Grand Forks smelter.——The Yankee Girl Gold Mines, Ltd., has purchased a 5-drill compressor, drills, and accessories. This property has made an excellent showing this year, shipping 3432 tons of ore so far and opening new ground all by hand labor. Larger shipments and cheaper working costs will result when the power plant starts.——Excavation work has been started on the concentrator for the Aurora mine at Moyie. The showing at the Aurora is said to be very encouraging at this stage.——The 700-ft. adit on the Mother Lode group, Sheep creek, has tapped the vein at a depth of 480 ft. from the apex. This is the fourth adit that has been driven on the Mother Lode zone and the expectations of the management have been fulfilled in each instance.——The work of getting things in running order at the Whitewater mine and mill is now under way, but is being hindered somewhat by lack of railway facilities, the Great Northern having been disabled by the burning of its bridges.

Rossland, August 19.

KOREA

(Special Correspondence).—The Korean Exploration Co. is preparing to reorganize and increase its capitalization by $250,000 for the purpose of installing a large modern dredge upon its Chicksan placers. The company is at present operating a small Nissen stamp-mill upon one of the quartz veins and has an additional three-stamp Hendy mill upon the ground which is to be erected upon another property.——The Seoul Mining Co. has recently purchased the 20-stamp mill and machinery of the British-Korean Syndicate at Gwendoline and will add it to the present 20-stamp installation at Suan. The total bullion output of this company for June exceeded $25,000.——The Oroyo-Brownhill syndicate has purchased several claims adjoining its old property in the Sakju district and is pushing development. It is rumored that the syndicate has secured an option for prospecting purposes upon the French concession of Chang Song, one of the largest in Korea, and will commence work as soon as the present Korean lease expires.——Great activity is being shown lately in Korean placers, both foreigners and Koreans applying for claims in great numbers. A company has recently been formed locally for the purpose of prospecting and buying dredging properties.

Seoul, July 22.

MEXICO

CHIHUAHUA

The July production of the Rio Plata Mining Co. amounted to 82,000 oz. of silver. This is the largest monthly production on record, the best previous showing having been made in January, when 71,164 oz. were produced. Last month's shipment of bullion, to Monterey, brought $40,340.——The Maria mine, in the Roncesvalles district, which is now being worked by J. W. Hambleton, of Parral, shipped the first car of ore recently and now has three more cars ready for shipment.

Personal

Professional men are invited to send notes of their engagements and travels. Such news is interesting to friends.

J. W. Finch is at Bodie.

C. S. Herzig has been in San Francisco.

Charles Janin has been at Los Angeles.

S. W. Mudd was in San Francisco last week.

J. R. Phillips was in San Francisco this week.

Ralph Arnold was in San Francisco Tuesday.

J. R. Finlay was in San Francisco Wednesday.

Godfrey D. Dowlton has been in San Francisco.

William Forstner is in New Mexico examining mines.

W. H. Storms is visiting the San Juan region of Colorado.

L. K. Fletcher is at the Rincon mine, Temescaltepec, Mexico.

I. Fore, of Redlands, California, was in San Francisco this week.

W. Murdock Wiley returned from Los Angeles to San Francisco this week.

Hugh R. Van Wagenen has been examining mines in the San Juan district of Colorado.

Alexander P. Rogers is making examinations in Siberia and will not return to New York for some weeks.

T. C. Crowe, of the Portland Gold M. Co., Victor, Colorado, who was in San Francisco, has gone to Nevada.

Thad F. Van Wagenen has returned to Denver from a trip into the region between Cobalt, Ontario, and the head of James Bay.

E. G. Deutsenberg, of Honolulu, passed through San Francisco this week on his way home after an inspection of the oilfields of California.

J. B. Tyrrell has left for a short visit to London. His address will be care Mining and Metallurgical Club, St. Ermin's, Westminster, London, S. W., England.

Walter O. Snelling, of the U. S. Bureau of Mines, who has been traveling through Alaska, visited San Francisco and Grass Valley, California, on his way back to Pittsburg.

E. M. Hamilton has left Candor, North Carolina, for Ventanas, Mexico, where he will be for a month, after which his address will be care Lluvio de Oro G. M. Co., Chihuahua, Mexico.

Los Angeles Members of the Mining and Metallurgical Society of America have arranged for a subscription dinner at the Sierra Madre Club at 6:30 p. m., September 29, the price being $2 per plate. Members are requested to reserve places for themselves and guests by sending word to S. W. Mudd, 1101 Central building, Los Angeles, before September 28. Through the courtesy of the engineers of the Los Angeles aqueduct an excursion to two divisions of that great work has also been arranged, occupying October 1 and 2. The party will leave Los Angeles Friday evening, September 30, on 'The Owl' train of the Southern Pacific, and will stop at the Fred Harvey hotel at Mojave that and the succeeding night. Autos will be provided for the excursion Saturday over the Jawbone division to the north, and Sunday for inspection of interesting tunnel work to the south. A session of the members will be held at the hotel Saturday evening, and from Mojave visiting members can return to Los Angeles or go directly north or east Sunday evening, as may be most convenient. It is impossible to give an exact estimate of the total expense of the trip, though it will probably not exceed $25 per person. Owing to limited accommodations at Mojave it is necessary that members expecting to take part in the excursion signify their purpose to do so by a note to Mr. Mudd, on or before September 26. In making arrangements preference will be given to members, but to the extent that accommodations can be secured, guests will also be welcome. At some convenient time at Los Angeles or Mojave an executive session of the members present is proposed to consider the work of the Society.

Recent Publications

Middle Devonian of Ohio. By Clinton R. Stauffer. Geol. Surv. Ohio, Ser. 4, Bull. 12. Pp. 204, Ill., index. Columbus, 1910. A detailed stratigraphic report.

Building Operations in the United States. By Jefferson Middleton. U. S. Geol. Surv. Advance chapter from Mineral Resources, 1909. Pp. 17. Washington, 1910.

Quality of the Surface Waters of California. By W. Van Winkle and F. M. Eaton. U. S. Geol. Surv. Water Sup. (Ry) Paper 237. Pp. 142, Ill., index. Washington, 1910.

A Series of American Rocks. By the Foote Mineral Co. Pp. 40, Ill. Foote Mineral Co., Philadelphia, 1910. A work descriptive of numerous type rocks occurring in America.

Map of Orient Mining District, Washington. By L. K. Armstrong. Map shows drainage of the region and mining locations near Orient. Price 10c. L. K. Armstrong, Spokane, 1910.

South Pass Gold District of Wyoming. By H. C. Beeler. Pp. 24, Ill. A description of the old gold camps of Independence, Miners Delight, and Atlantic City, near South Pass, Wyoming.

Establishment, Purposes, Scope, and Methods of the State Geological Survey of Tennessee. By Geo. H. Ashley. Extract A, Bull. 1, State Geol. Surv., Tennessee. Pp. 33. Nashville, 1910.

Rodent Fauna of the Late Tertiary Beds at Virgin Valley and Thousand Creek, Nevada. By Louise Kellogg. Bull. Dept. of Geol., Univ. California. Vol. 5. Pp. 411, 437, Ill. Berkeley, 1910.

Surface Water Supply of the United States, 1907-08. Part XI. California. By W. B. Clapp and F. W. Martin. U. S. Geol. Surv. Water Supply Paper 251. Pp. 353, Ill., index. Washington, 1910.

Surface Water Supply of the United States, 1907-08. Part VI. Missouri River Basin. By R. Follansbee and J. E. Stewart. U. S. Geol. Surv. Water Supply Paper 246. Pp. 311, Ill., index. Washington, 1910.

Movement of Lake Superior Iron Ores in 1909. By John Birkinbine. U. S. Geol. Surv. Advance chapter Mineral Resources of U. S., 1909. Pp. 7, map. Washington, 1910. A revision of the map that first appeared in 1902.

Forests of Alaska. By R. S. Kellogg. Bull. 81, U. S. Department of Agriculture, Forest Service. Pp. 24, Ill. Washington, 1910. An especially valuable general summary written by a thoroughly competent officer.

Mining Laws of Wyoming and of the United States. By Henry C. Beeler. Pp. 116, index. Cheyenne, Wyoming, 1910. A new edition of a valuable little pamphlet compiled in 1907. It will be sent free on application to the State Geologist, Cheyenne, Wyoming.

Report Geological Survey Branch of the Department of Mines of Canada for 1909. By R. W. Brock. Pp. 307, Ill. Ottawa, 1910. This report summarizes the work of the Geological Survey in the several provinces of the Dominion for the year.

Report Minister of Mines, Canada, Annual, 1909. By Richard McBride, Minister of Mines, Victoria, B. C. Pp. 298, Ill., maps, index. Victoria, 1910. An interesting description of the condition of the mineral industry in British Columbia in 1909.

Miscellaneous Nonmetallic Products. By D. B. Sterrett and H. S. Gale. U. S. Geol. Surv. Bull 430-J. Contributions to Economic Geology for 1909. Pp. 52. Washington, 1910. The 'Mica Deposits of North Carolina' and 'Supposed Graphite Deposits near Bingham, Utah,' are described in detail.

Rare Metals. By Howland Bancroft, J. M. Hill, F. C. Schrader, E. C. Harder, T. L. Watson, and Stephen Taber. U. S. Geol. Surv. Bull 430-D. Contributions to Economic Geology. Pp. 68, Ill. Washington, 1910. Recent notes on cinnabar, molybdenite, tungsten, chromite, monazite, platinum, rutile, and other minerals of exceptional occurrence.

Market Reports

LOCAL METAL PRICES.

San Francisco, August 25.

Antimony	12—12¾c	Quicksilver (flask)	46½—47
Electrolytic Copper	14½—16¼c	Spelter	7—7¼c
Pig Lead	4.70—5.65c	Tin	36—37½c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Aug. 18	12 53	4.40	5.15	53
" 19	12.53	4.40	5.17	53
" 20	12.53	4.40	5.20	52⅞
" 21	Sunday.	No market.		
" 22	12.53	4.40	5.22	52⅞
" 23	12.53	4.40	5.22	52⅞
" 24	12.53	4.40	5.25	52⅞

ANGLO-AMERICAN SHARES.

Cabled from London.

	Aug. 18. £ s. d.	Aug. 25. £ s. d.
Camp Bird	1 7 9	1 8 3
El Oro	1 6 6	1 6 9
Esperanza	2 15 0	2 15 0
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 3	0 6 3
Mexico Mines	8 16 3	8 17 6
Tomboy	0 16 3	0 16 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Aug. 25.		Closing prices, Aug. 25.
Adventure	6	Mohawk	47½
Allouez	40	North Butte	27¼
Atlantic	4½	Old Dominion	30
Calumet & Arizona	50	Osceola	125
Calumet & Hecla	560	Parrot	13½
Centennial	18	Santa Fe	1⅝
Copper Range	65	Shannon	9¾
Daly West	6¼	Superior & Pittsburg	11⅛
Franklin	10¼	Tamarack	55
Granby	33	Trinity	6
Greene-Cananea, ctf	7	Utah Con	23
Isle-Royale	19	Victoria	2½
La Salle	10	Winona	7½
Mass Copper	7¼	Wolverine	125

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Aug. 25.		Closing prices, Aug. 25.
Amalgamated Copper	64	Miami Copper	19¼
A. S. & R. Co	66⅞	Mines Co. of America	⅜
Boston Copper	18⅞	Montgomery-Shoshone	⅛
B. C. Copper Co	47⅛	Nevada Con	19⅞
Butte Coalition	18⅜	Nevada Utah	⅝
Chino	14⅜	Nipissing	10¾
Davis Daly	1¾	Ohio Copper	2
Dolores	5½	Ray Central	2¼
El Rayo	3⅜	Ray Con	18⅛
Ely Central	⅝	South Utah	1¾
First National	3¾	Superior & Pittsburg	12
Giroux	6½	Tenn. Copper	24
Guanajuato Con	1	Trinity	6¼
Inspiration	5⅛	Tuolumne Copper	2⅜
Kerr Lake	6½	United Copper	5
La Rose	3⅞	Utah Copper	45
Mason Valley	7¾	Yukon Gold	3⅛

SOUTHERN NEVADA STOCKS.

San Francisco, August 25.

Atlanta	$ 15	Mayflower	$ 4
Belmont	3.85	Midway	25
Booth	12	Montana Tonopah	89
Columbia Mtn	6	Nevada Hills	2.20
Combination Fraction	42	Pittsburg Silver Peak	45
Daisy	4	Rawhide Coalition	12
Fairview Eagle	40	Rawhide Queen	25
Florence	2.07	Round Mountain	43
Goldfield Con	8.20	Sandstorm	4
Gold Kewenas	7	Silver Pick	8
Great Bend	4	St. Ives	19
Jim Butler	25	Tonopah Extension	87
Jumbo Extension	42	Tonopah of Nevada	8.65
MacNamara	27	West End	56

(By courtesy of San Francisco Stock Exchange.)

COMMERCIAL PARAGRAPHS

The Hendryx Cyanide Machinery Co. has moved its office and exhibit room from Denver, Colorado, to 107-109 William street, New York City.

The Wood Drill Works, Paterson, New Jersey, has been awarded a contract by the Isthmian Canal Commission for 2100 'Wood' brand hose couplings.

James H. Pershing, Frederick S. Titsworth, and William R. King have established the law firm of Pershing & Titsworth, at 404 Equitable building, Denver, Colorado.

Cox & Juessen have established offices in the Sheldon building, San Francisco, and will hereafter devote some time to examination work as well as management.

The Mine & Smelter Supply Co. announces the appointment of T. Evans, formerly purchasing agent for The Cananea Consolidated Copper Co., as local manager of its branch house in Denver, Colorado.

The C. O. Bartlett & Snow Co., Cleveland, Ohio, has leased the property recently vacated by the McMyler Mfg. Co., and will install a large amount of additional machinery, thereby greatly increasing the capacity of its own plant.

Sylvester S. Howell has become associated with Paul M. Chamberlain, engineer, Marquette building, Chicago, under the firm name of Chamberlain & Howell. The firm will carry on the general designing and consulting practice established by Mr. Chamberlain.

Bert. M. Meadows, for several years connected with the Charlotte Supply Co., of Birmingham, Alabama, has joined the selling force of the J. Geo. Leyner Engineering Works Co., assisting its Birmingham representative, K. B. Stephens, in handling the drill and drill sharpener business in the Southeastern States.

The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio, advises that it has recently received an order for 500 cars from the Illinois Tunnel Co. for use in conveying freight under the streets of Chicago. The cars are to be small double-truck gondolas of all steel construction with a capacity of 15,000 pounds.

The Lane Slow Speed Chilian Mill Co., Los Angeles, advises that it has recently made sales of Lane mills to the following: Bonnie Doone mine, Indian Trail, N. C.; National Mining Co., National, Nev.; Cia. Minera Garduna y Anexas, Placeres de Oro, Mexico; Isabelle Mines, Casa Grande, Ariz.; Stafford mine, Vicksburg, Arizona.

The Hampson-Fielding Engineering Co., Denver, is moving into its new quarters at 1713 Wazee street, on 'Machinery Row.' A great advantage in this location will be the standard-gauge track at the rear of the store. The Hampson-Fielding Engineering Co. has secured the account of the Edgar Allen Co. and carries a full stock of its steel for mining and other purposes.

C. F. Buck, who has been with the American Smelting & Refining Co. for a number of years as designing and constructing engineer, has recently opened an office as consulting engineer at 416 Newhouse building, Salt Lake, Utah. Mr. Buck has had wide experience in the design and construction of both lead and copper smelters as well as mining and power plants.

J. B. McIntosh, lately engineer in charge of the new Tooele plant of the International S. & R. Co., has resigned to become superintendent of construction for the A. S. & R. Co. at the Garfield plant. E. E. Thum, lately chief civil engineer for the Tooele plant, has been transferred to the position of engineer for the Boston & Montana Reduction Works, of the Anaconda Copper Mining Company.

The Foos Gas Engine Co., Springfield, Ohio, is preparing plans for a new building necessary to double the output. For the last ten months the factory has worked a double shift. In spite of all the extra working time the salesroom has been loafing along way ahead of the increased output with orders piling up for special hoisting equipment. The splendid organization with which this factory is operated will soon have orders well under control.

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Alta Mining Co	10 "	Mt Tumolus Mining Co	10 "	Soulsby Mining Co	10 "
Utica Mining Co	10 "	Oriole Mining Co	10 "	Golden Mining Co	10 "
Black Oak Mining Co	10 "	Clary Mining Co	10 "	Hardenburg Mining Co	10 "
Gold Hill Mining Co	20 "	Sultana Mining Co	10 "	Clarkman Mining Co	10 "
Reiner Mining Co	20 "	Benson Mining Co	10 "	Comstock Tunnel Co	10 "
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EDITORIAL

OUR article on 'Australia's Premier Tin Mine,' published June 4, was, it seems, based on material originally collected for *The Argus*, published at Melbourne, a fact but recently called to our attention. We hasten to make acknowledgments and regret that an unintentional discourtesy has been shown to that enterprising newspaper.

PEAVINE, a small peak near Reno, Nevada, that was represented last week as having become an active volcano, proved on exploration to be a tilted fault block consisting of granite, diorite, andesite, and some Mesozoic schists. The painstaking investigator who climbed to the top reports that the only smoke apparent was from distant forest fires.

BROMINE, while widely applied to the treatment of Australian gold ores, has not been extensively used in America. For that reason the details as to treatment and results at the Black Oak mine in California in 1905 are of interest. They are given in our Discussion department this week by Mr. Murray N. Colman, who was chemist in charge at the time the work was done.

RESUMPTION of sinking in the deep vertical shaft of the Kennedy mine at Jackson, California, will further strengthen faith in the possibilities of deep mining on the Mother Lode. The shaft has passed the 3500-foot mark and is going down at the rate of about 90 feet monthly. The deepest level at present is at 3300 feet, where there are well developed veins of profitable ore.

PANAMA Canal excavation during July totaled 2,406,288 cubic yards, for the second time this year dropping below the 100,000 cubic yard daily average, with an average of 96,252 cubic yards for each of the 25 working days. The rainfall for the month was 15.65 inches. The amount of concrete laid during July was 131,653 cubic yards, against 124,214 in June, and 654,095 of fill was placed in dams, against 664,155 cubic yards in the previous month.

MUCH has been contributed at various times to the gaiety of the Nation by Mr. F. Augustus Heinze, and much it is reputed, to disquiet at 26 Broadway. His has been a stormy career, and even his honeymoon is being disturbed by tales of a 'Titian haired siren.' It is well to remember that Mr. Heinze has at least some good constructive work to his credit and to his faith and foresight is due the Ohio Copper Company, whose mill is discribed on another page by Mr. Leroy A. Palmer. Associated with Mr.

Heinze in the project are a number of excellent and capable men, and long after he and his personal troubles are forgotten, the world will be the richer for the enterprise.

HEAVY monolithic structures, comprising mortar-block, battery posts, and the necessary beams usual in such construction, are now advised by Mr. G. A. Robertson at Johannesburg, South Africa. He suggests that the entire structure can be made of reinforced concrete, which would be fire-proof, without joints, and in every way more durable, and better able to resist the tremendous vibration of heavy stamps, than wood alone, or composite structures of both wood and concrete.

PRACTICAL WORK in surveying involves many short cuts and 'tricks of the trade' that do not get into text-books. We are glad to present an account of some of them written by Mr. A. E. Robinson, who has had large experience in the Coeur d'Alene district. Not everyone will agree with all his methods, but all may take to heart his shrewd observation that accurate results depend more on the care with which a method is applied than on the method itself. This applies to more things than surveying.

THE AUGUST number of *The Mining Magazine* is, as usual, full of things well worth reading. It marks the end of the first year of publication of this highly useful periodical. An international review of mining had long been needed as has been proved by the success attending Mr. Rickard's London enterprise. The road of the pioneer is easy now as compared with that traveled by the *Mining and Scientific Press* fifty years ago, but pluck and skill evidently count near London Wall as they did in the City of the Golden Gate.

REPORTS from the tin mines of the Black Hills of South Dakota are encouraging. In two districts, one in the Harney Peak region, the other at Nigger Hill, attempts have been made for several years to place the production of tin on a commercial basis but up to the present year these efforts have seemingly fallen a little short of success. That the granite dikes carry cassiterite is well known, but the metallurgical problem is serious and it has been the stumbling block in the road to success. The ores differ from those of other tin-producing districts of the world, and, in fact, among themselves. Difficulties in the way of successful concentration have thus far baffled the serious efforts and expensive experiments of the Black Hills operators. Perhaps it is more a problem of economics than of mechanics that must be solved.

FOREST fires, while not so serious as last week, continue to burn in many parts of the West. In a recent interview Mr. Gifford Pinchot has pointed out that with a larger force of rangers, with paths through the forests, and with more telephone lines, much if not all of the damage could have been avoided, since the fires would have been extinguished before they got beyond control. Certainly it is ridiculous to attempt to protect over 200,000,000 acres of woodland with less than 3000 men. In some cases a single man has been responsible for protecting more than 100,000 acres. In other cases there were no trails whereby men could make their way to the danger points and in every way the fire-fighters were hampered by inadequate preparation. A heavy responsibility rests on Mr. W. B. Heyburn, Mr. Thomas H. Carter, and Mr. F. W. Mondell, who have done so much in Congress to cripple the Forest Service.

CRIPPLE CREEK is anticipating a boom. Within a few days the deep drainage tunnel has begun to draw water from the mineral-bearing ground. According to the determination of Messrs. Lindgren and Ransome of the U. S. Geological Survey the ores long worked at Cripple Creek are primary. There exists therefore no reason to anticipate increasing poverty within minable depth, except as the rocks because of being less fractured may not have permitted formation of as large ore-shoots. In the opinion of keen observers the lower levels now open show much less fracturing than above, as is well in accord with common principles. Still lower ground may be even less fractured. Granting this, however, there is none the less every reason to anticipate the finding of much good ore and this will doubtless stimulate further development in many mines now closed. On the whole the pleasant hopes of operators at Cripple Creek rest on solid foundation.

ZINC has been the bugbear of Western ore producers so long that it is difficult for them to learn to look on it as an asset. The analysis of present conditions in the zinc-smelting industry presented this week by Mr. R. G. Hall, the accomplished general manager of the United Zinc & Chemical Company, indicates that Western miners would do well to look after the zincblende now being wasted. Zinc smelting has long been the most backward of the great smelting industries because of the peculiar metallurgical difficulties involved in reducing this most volatile of metals. Improvements in the last fifteen years have been numerous and results now regularly obtained are marvelous when compared with those in the small coal-burning Belgian furnaces, treating hand-roasted ore, that dotted the prairies of eastern Kansas in the nineties. In recent improvements in zinc smelting American metallurgists have had a large and honorable part, quite making up for the earlier years of neglect of the industry.

STANDARDIZATION of mining and metallurgical terms seems to be making progress. The sub-Committee of the Chemical, Metallurgical, and Mining Society of South Africa, has presented a brief but excellent report embodying provisional recommendations, among which we recognize many for which the *Mining and Scientific Press* has consistently argued. Except when otherwise necessary such words as sand, tailing, and slime, are to be treated as collective nouns and therefore used in the singu-

lar abbreviations such as oz. lb. gal. are not to be printed in the plural. sheet is restricted to geological usage while chute is to be used to describe a passage or opening through which material is guided. in referring to screens whether the number of holes refers to the square or linear inch should be stated. the 2000 lb. ton is to be used and various other precautions are to be taken to prevent confusion. It is easy to go to extremes in reforming so illogical a thing as language but the need of greater uniformity is so great that efforts in this direction will be welcomed by all workers in technology.

Mr. Roosevelt and the Insurgents

Osawatomie is a small city in eastern Kansas, known as the scene of conflict between Mr. John Brown and his followers and certain upholders of slavery in the troublesome days of 1856. It is a prosperous centre of a rich farming community, but its people have ever been alert as regards anything touching on freedom. It was peculiarly appropriate that Mr. Theodore Roosevelt should journey to that point to make his long anticipated profession of political faith and the speech that he made on the last day of August, is vibrant with the characteristic feeling of the community. Read in the light of his earlier speeches and his whole career, it is exactly what would have been expected. There is the same plea for the average man, the same demand for equality of opportunity, the same criticism of the corrupt rich and vicious poor, the same exhortation to progress. No one who has studied Mr. Roosevelt has doubted that his heart was with the Insurgents in his party. Their opposition to special interests is the essence of his own political creed. The significance is not in that he believes with them but that he openly sides against the leaders of his party. Mr. Roosevelt is probably the keenest politician in America. He knows and values public opinion as does no one else. He is undoubtedly the most widely popular man in the country and he counts on that popularity as a means to his ends. As a prudent fighter he chooses well the time and season for each public act and that he should now throw his influence openly with the 'Progressives', as he prefers to call them, means that the best reader of public opinion in this country sees victory for them. No wonder Wall Street is disturbed, for Wall street, like big business everywhere, does not so much dread reform as change. The men who know the game as it is now played, who can win under present rules, naturally fear any proposal for change. To mining men the most significant point in Mr. Roosevelt's recent speeches is his unequivocal advocacy of a leasing system for mineral lands. That old abuses must be corrected is now everywhere conceded, but whether the change should take the form of introducing leasing, is a matter about which there is no agreement. Mining men, as the ones most interested, should inform themselves and formulate their program; and in doing so they should, like Mr. Roosevelt, take careful account of public opinion throughout the country.

English Estimates of Peruvian Copper

Ferrobamba Limited has been up for renewed discussion in London. Mr Claude Vautin has returned from his examination of the property and confirms in the strongest manner the estimates of Mr W. E. Gordon Firebrace as to the amount of copper bearing rock in this new Peruvian mine. At the Ferrobamba No. 1, some 27,645,700 cubic yards of material are calculated to be available by open cut workings with enormous amounts to be won with each additional foot of depth. "As to the percentage of copper this mass of ore is likely to contain, it is, of course, not possible at the present stage of operation to tell," remarked Mr. Vautin at the meeting of the shareholders held in London August 4, after which conservative statement results of incomplete sampling were quoted that showed 6 per cent copper with 9 grains gold and 3 ounces silver, and it was pointedly implied that the bulk of the material is at least of approximately this grade. We must confess our sympathies are with the anxious stockholder who asked "Whether, in addition to the enormous deposits of copper which this company owns, there are other deposits of like nature, because if so, and they are of anything like the same extent that these run to, and can be operated on anything like the same colossal scale, it will possibly bring down the price of copper to such a level as to have a very serious effect." It is quite comforting to have the assurance of the chairman that "so far as we know, there are no other deposits of the same character anywhere near ours, and the man from whom the properties were purchased, Mr. Hilfiker, spent five or six years looking for other deposits and was unable to find any."

This matter then being so satisfactorily and completely disposed of, it may be well to consider a moment the matter of uniformity of distribution of copper through the great garnet mass that evidently exists along the contact of the hornblende biotite granite and limestone. There is no reason to doubt the accuracy of the calculations to the amount of garnet rock present but the amount of sampling yet done, so far as there is any published statement, utterly fails to warrant the inference that the whole or the major part of it contains 6 per cent of copper. Such a conclusion is furthermore contrary to experience elsewhere, and particularly with the great porphyry coppers of the United States, where more has been done than elsewhere and a better basis exists for forming an opinion. Mr. Vautin affirms his unhesitating belief "that the copper values are uniformly disseminated through the garnet rock;" which is entitled to respectful consideration as a belief. It is fair, however, to point out that Mr. Vautin is better known as a metallurgist than as a geologist and the need of further examinations and of caution may be properly urged. Without much doubt the Ferrobamba is an important copper property, certainly Peru does contain enormous ore deposits and vast potential mineral wealth, but before throwing aside all previous standards of measurement we shall await the results of drilling now being begun.

Details of Mine Surveying

By A. E. Robinson

Many textbooks, and some technical schools, give instruction in surveying. Few of either go deep enough into the subject to be practical, confining their teaching to generalizations, giving many methods, but not specifying which is to be used under given conditions; explaining the manipulation of the instruments used, but giving no directions for intelligently recording the operations performed. Consequently few technical graduates are competent to make a survey; they must first take a post-graduate course under some practising engineer before they can perform the few, simple, and almost mechanical, operations that go to make a survey. It is hoped that this class of men in particular will find something of benefit in the following, as these notes give an abstract of the instructions I have found necessary to give to graduates. As stated, it is a simple proceeding to make a traverse survey; there is nothing complicated nor involved in it, yet, by doing it carefully and conscientiously it is possible to achieve accuracy that is as beneficial to employer as it is pleasing to the surveyor.

The following are some of the methods employed by myself recently in conducting a survey in which over 13,000 transit points were used and 143 miles of surface and underground traverses run. To many, and particularly the experienced engineer, there may seem to be an unwarranted refinement in these methods, yet in this particular work the pains taken were justified by the results. The purpose for which a survey is made and the time at the engineer's disposal will govern the amount of extra precaution he will take to insure accuracy. The greatest error in this survey was 1 in 4500, the smallest 1 in 13,000, with an average of 1 in about 6500. Credit is due to R. J. White, chief engineer of the Federal M. & S. Co., Wallace, Idaho, and to Edw. C. Uren, engineer, Nevada City, California, for many valuable suggestions.

Perhaps the most severe test to which a survey and map may be put is in litigation; an engineer may bluff a foreman into believing that a raise did not 'hole through' into a drift at the desired point because the miners did not follow his line, but an error in a map, that ordinarily would be of small consequence, would, in a court room, under the scrutiny of the engineers of the opposing side, be speedily brought to notice of the court, and would cast a strong shadow of doubt over the entire map, and on all testimony given in which reference was made to the map. Acquire the habit of accuracy, therefore, by always working to obtain the greatest exactness, and you will never get caught with inaccurate maps. The presumption that work is accurate depends upon the care exercised in its performance and the methods employed. This presumption, in surveying, amounts to proof in the case of a traverse that either closes on itself, or on some point whose position is known. In a 'blind' traverse—one not connected at both ends with known points—where there is no opportunity to check the correctness of the work, dependence must be placed entirely on the two factors stated. The first, care, is an entirely personal one. It is a moot question among engineers as to which methods are best. Some engineers get good results with methods that to another would be difficult, unsatisfactory, and confusing. I never knew an engineer who did good work who did not ascribe his success to the methods he used rather than to the care with which he employed his own methods, and yet it was to the latter that most of the credit was due. He was able to distinguish between the good and the bad in his system, and yet it may not have been the best. Good practice may be defined as that which invariably gives results as near the absolute as is possible with the instruments used by any instrument man. Consequently for a method to be the best, it must give equal accuracy under all conditions. The best method for making this survey was decided upon after comparing the advantages and disadvantages of all methods and adopting that which possessed a maximum of advantages, a minimum of disadvantages, and which afforded a complete check on itself.

To eliminate the errors due to human failings, as well as those due to imperfections in instruments, the same resultant should be obtained by two different methods. A man may read a deflection angle between two courses; it would not be a check on his work if he re-read the same angle in the same manner as at first. He might make the same personal error in reading, or either the horizontal axis or line of collimation might be out of adjustment, and while the angle read in both instances would be identical, it would still be incorrect. Therefore, in performing an operation for the purpose of checking any other operation, do it so it will check beyond doubt. This applies to work in the office as well as in the field, and he is the best engineer who invariably checks his every move. In the field do not only check your work to your own satisfaction at the time, but record it in your notes, that each setup may, if necessary, be checked in the office. This is particularly necessary in the survey of workings that are being used in the operation of the mine. A rapid lateral motion accompanied by a frantic grabbing of the instrument (never call it a 'machine'), to avoid contact with a loaded car on a down-grade, has been known to affect a transitman's nerves to the extent of rendering doubtful the notes taken for several hours thereafter.

Traverses are run in mine surveys for the purpose of fixing in the three planes of projection certain points in the mine, and on the surface above. From these points the contour of the surface, and of underground workings, and the position of other points, corners of claims, and other data, are ascertained. The transit is the instrument used. In all work around a mine, the light transits, weighing about 14 lb., give as good results as the larger instruments, and are to be preferred on account of the greater ease with which they can be set up in 'tight' places and from the fact that they are much easier to carry.

In surface surveying, the points are usually 6-

penny finishing nails pushed through into the logs. I holes extending from 2 to 4 ft. above the ground. Underground the points used vary, and there is little choice, providing the point be one cheaply and easily made which will not rust and drop out, and from which a plumb-bob will always hang in the same position. The necessity for the last will be appreciated when it is remembered that in making a traverse the point is used three times, by the foresight and backsight bobs, and by the transit bob. I prefer a horseshoe nail having its head flattened and with either a fine saw-cut made in the edge or a hole not exceeding ⅛ in. diam. punched in the lower edge. Six-penny finishing nails bent to a U make satisfactory temporary points, are quickly made, but they soon rust and must always have a plug driven in the 'back' to receive them, as it is generally impossible to find a crack in the rock overhead at the right place into which they can be driven. Horseshoe nails can be driven into a small crack, and being made of soft iron, do not rust quickly.

To run a traverse of underground workings, the transit is set up under the last point set, by 'under', I mean under specifically, and not generally. The best bob to be obtained should be used in this work. I have found it to be expeditious to use a small hook on the upper end of the plumb-bob string; this is hooked into the transit point overhead, and the bob raised, or lowered, to the right elevation by means of an adaptation of the old, familiar, pants-button slide. A doubled string, or piece of fine copper wire, is run through the top of the bob, leaving a loop at the top; one end of the bob-string is fastened to the hook, and the other end threaded through two holes in the button, then through the loop and back to the button, to which it is tied. By using the slide arranged in this manner, the bob can be manipulated with one hand. The back and foresight bobs are then hung on their respective points, the plate set, and the first operation, that of getting the foresight course, commenced.

Courses are carried by several different methods most of them good when care in using them is practicable, but few methods, when used alone, are adaptable to all conditions. The courses may be carried direct on the plate, referred to either the north or south point alone. This is known as carrying azimuths. In working with this method, when the transit is set-up ready for work, the line through 0 and 180° will coincide with the meridian, with the 0° usually to the south. The last-read azimuth is set off on the plate, the telescope directed to the backsight and clamped. The upper limb is then unclamped, the telescope transited or revolved on the vertical axis and directed to the foresight, and the azimuth of the foresight-course read. All of the courses in the northeast and northwest quadrants (and in one of the south quadrants also, if the azimuth be read in but one direction), must be calculated. It has the advantage that all courses are expressed simply, in terms of degrees and minutes in the field notes. The course may be carried on the plate, referred to the meridian, and having the quadrant in which the course lies noted. There are a number of advantages to this, the course is always known in the field without calculation, and is stated in the same terms in the notes as will always be employed for that course thereafter, the office work is simplified, and that makes for accuracy and economy. The disadvantages are: liability to reading a wrong course when it is nearly east-west or north-south, N 89° W may be read S 89° W; liability to reading the course in the wrong quadrant, a northwest course may be read southeast, if the transitman is in unfamiliar workings, or gets 'turned around', errors of 1, 2 or even 10 degrees can thus easily be made. Perhaps the most serious objection to using either of the above methods lies in the necessity of re-running a traverse if an error has been made, there being absolutely no other way of determining the point at which the error was made.

Deflection angles may be read. This method is simple inasmuch as the vernier is set at 0° on the backsight, it halves the error of reading, for the vernier on any instrument not having a micrometer attachment, can be set at some even degree closer than it can be read when set at random. The angle can be checked by doubling. The use of deflection angles, however, involves calculation of courses in the office, thereby introducing extra work and liability to error, which liability is greatly increased when the office work is done by men unfamiliar with field conditions.

To check any horizontal angle, it should be read once with the telescope direct and once with it reversed. This eliminates errors of collimation, and in taking inclined sights is a partial check on the horizontal axis as well. It is possible for both axes to be out of adjustment, and the errors to apparently compensate for a certain inclination of the line of sight. When reading a deflection angle, and doubling it as a check, a third reading is necessary, with the telescope reversed, to check the collimation. This need not be done at every station, yet transits sometimes have the very disagreeable habit of getting out of adjustment without apparent provocation and without warning, and especially in small working places and on a rough surface where it is not always possible to avoid jars. It is a good thing to know the fineness of the adjustment of the transit at all times.

A combination of carrying the course on the plate and reading deflection angles has been found to be most satisfactory. The course is read, and checked by a deflection; this gives all of the advantages of using both methods alone, eliminates all the undesirable features of using either separately, and requires no more time in the field than any other method. After the deflection angle has been read (with the telescope pointing opposite to its position when the course was read), the course is calculated. If this does not agree with the first reading, the reason must be found and the correct course determined before proceeding further. If the line of collimation be in correct adjustment and the work has been carefully performed, it is probable that the difference is due to the fact that few lines in the field

make an angle of some even minute with any other line. The deflection angle can be doubled to ascertain if this be the cause. In many cases this is an unnecessary refinement, and would be used only when extreme accuracy was important. When the difference is small—not exceeding half a minute—this difference is the sum of all the natural errors, namely, those due to the personal equation, to imperfect adjustment, and to that portion of the angle that is too small to be read. Errors of half a minute will generally balance in a traverse of considerable length. To eliminate the errors due to lack of fine adjustment, read the courses at all even-numbered set-ups with the telescope direct, and at all odd-numbered set-ups with it reversed.

The advantages of reading a course and checking it with a deflection angle are: as perfect a check as can be had on the manipulations of the transit: the courses are known in the field, and are ready for the office men without calculation: if by any chance an error is made in the field work that is not detected until the notes are computed or platted, it can, in most cases, be found by referring to the notes, and without re-running the traverse. As a matter of fact, it is almost impossible for an error to creep into the survey when this method, or combination of methods, is used, but if an engineer makes one hundred set-ups and has one error, yet will he forsake the ninety and nine good courses and seek the one that gives him the trouble. Another advantage is manifest when in making a survey where it is necessary to start on an assumed or a magnetic course, and afterward 'tieing' into some known course. Assuming the course of the known line to be 30 min. greater in the northwest quadrant than the course of the same line from the assumed meridian, 30 min. must be added to every course in the northwest and southeast quadrants, and be subtracted from every one in the northeast and southwest quadrants. The entire new set of courses can then be checked by the deflection angles. After obtaining the correct course in the field, the telescope is leveled and the foresight bob set at the horizontal wire if the sight be taken in a level working, and the distance from the centre of the horizontal axis of the instrument to the bob measured. Although there are a number of methods of checking the taping, any of which, if they were satisfactory, would be of particular value on the surface, where the measurements are longer than underground and consequently more liable to error, yet there is no scheme I have tried that has proved worth retaining. A distance should always be taped twice, to assure yourself that your assistant has held his end (the so-called 'ignorant end'), at the proper place, if for no other reason. In stretching the tape it is not necessary to attempt to pull your assistant out of his shoes to get a good measurement. For distances up to 200 ft. a pull of 20 lb. is sufficient. For greater distances, measurement 'on the swing' gives closer results. I have proved this, both underground and on the surface, with two tapes, one ¼ in. wide, and the other $^1/_{10}$ in. wide. In the first case the distance was 390 ft. The swing measurements agreed very closely with themselves and with the correct distance as obtained by measuring with the tape supported at intervals. When the taping was done with a steady pull, it was difficult to get any two measurements to agree with each other, and the tape indicated from 0.10 to 0.30 ft. greater than the actual distance. On the surface the distance was 645 ft. This was checked by a traverse between the hubs. The variation in measurements made with a steady pull was nearly as great in proportion as in the underground measurements; the swing distance and the traverse checked by 0.03 ft. In both cases both sets of measurements were made by two transitmen, separately, to make sure that the difference was due to the manner of taping only.

To get the swing, pull the tape fairly tight to get a handhold at the proper place, let it slacken slightly, and pull up the slack with a steady and fairly rapid pull. The centre of the tape will swing up until the entire tape is in an almost straight line: before it drops back, mark with the thumbnail the point on the tape opposite the centre of the horizontal axis, and pull the tape up again to check the position of the mark. Distances can be measured more accurately underground than on the surface and owing to the short sights underground, courses on the surface are the more nearly correct. Underground, the taping is always done from the instrument to the bob.

FORM OF FIELD NOTES

Def. 1.	Sta.	Vert. ang.	Slope dist.	Course.	Hor. dist.	To
	38		backsight	S.8°28′E.		39
L 00°02′	39	—44°32′	108.75 ft.	S.8°30′E.		40
L 22°05′	40			S.30°35′E.	21.49 ft.	41

This varies from the forms generally used. The deflection angle is placed on the extreme left to keep it out of the way of the rest of the notes—having performed its function of checking the course it is of no further immediate use, but is recorded for future reference. 'Sta.' indicates the station at which the set-up was made. The course is sandwiched between the slope distance and the horizontal distance to simplify office work; as in platting the eye has to follow the two columns of 'course' and 'distance' only, and they are therefore placed together, and in the order in which the platting is done.

Elevations obtained with the transit are generally sufficiently accurate for the underground and surface work done in connection with mining. The elevations in closed traverses will be found to check closer than the latitudes and departures. To adjust the horizontal wire and vertical circle of a transit, when a Wye level is to be had, set up the level and transit so that a line connecting the centres of both eye-pieces will be level when the telescopes are horizontal. Sight at some distant object through the level, then direct the transit toward the same object, and, by moving the tangent screw on the clamp of the horizontal axis, bring the horizontal wire of the transit on the same object. Then, with an adjusting pin, bring the bubble of the telescope level to the centre of the tube; loosen the vernier of the vertical circle and set it at zero. Like all adjustments, this requires patience, but it is simpler and quicker than the 'peg adjustment'.

Elevations are obtained in surface surveying as follows. The height of the centre of the horizontal axis above the transit point is measured and recorded. This is the H. I. The vertical angle to the foresight point is then read and recorded with its proper sign prefixed minus (—) if an angle of depression, and plus (+) if an angle of ascension. The slope distance multiplied by the cosine and sine of the vertical angle gives the horizontal and vertical distances respectively from the centre of the horizontal axis to the foresight. If the vertical angle is minus the H. I. is subtracted from, and if plus, is added to, the vertical distance to get the net vertical, namely, the difference in elevation between the two points. To check this, read the vertical angle to the backsight when set up over the point to which the sight was first taken. The tangent of this angle multiplied by the horizontal distance gives the vertical component, and the net vertical is obtained by substracting the H. I. of the new set-up from this vertical distance if the angle to the backsight be one of depression, and by adding, if it be one of ascension.

The first H. I. 2.13 ft. is the H. I. at Sta. 4 and the bob, 3.13 ft. the bob-height for the same sight at Sta. 5. On the second line is the bob-height at Sta. 4, 2.85 ft., when it was sighted from a set-up 3.85 ft. below Sta. 5. The net verticals of the two sights can be quickly figured in the field. Where a vertical angle is read, the notes are recorded as directed for surface work, with the bob additional. Where there is a difference of a few hundredths between the two net verticals their average may be used without introducing a serious error. Failure to agree may be due to lack of adjustment or a mistake made in taking or recording any of the angles or distances. It generally saves work to try to determine where the error lies. If the trouble lies in the transit, none of the net verticals in a day's work will agree. A mistake made in either the vertical angle or the bob-heights will appear at only one place, and the only thing to be done is to make a new set-up at either station. This will probably check with one of the net verticals obtained before. The same difference between two consecutive sets of net verticals is due to the H. I. at the middle station being wrong. If this difference be added algebraically to the H. I. in the notes, it will give the correct H. I. All additions to or alterations made in notes should be done with red ink, and the original note crossed out, but not obliterated. As the error made in taping is usually some even foot or tenth of a foot, a slope distance may be found by trial, which, when used with the angles, in the notes, will give equal net verticals. A measurement should then be made. The elevation of the floor or rail is taken at intervals by measuring from the transit point, and is recorded in the notes as a minus net vertical from the point.

FORM OF FIELD NOTES

Sta.	H. I.	Vert. ang.	Slope	Course.	Hor. dist.	To	Bob.	Vert.	Net Vert.
933	+ 2.18	- 17° 47'	135 ft.	..	128.55 ft.	934	0.00	— 41.23	— 39.03
933	0.00	— 15° 57'				934	+ 2.28	— 36.74	39.02

The underscored figures are the results of computations made generally in the office. On the first line is the H. I. at Sta. 933, then the minus vertical angle; under the 'bob' column is 0.00, indicating that the transit point itself was sighted. On the second line is the backsight reading from 934 to 933, but instead of being recorded as actually taken, is given as if taken from 0.00 set-up at 933 to a point 2.28 ft. above 934. This would be identical with the angle read from a set-up 2.28 ft. above 934 to the point at 933. The purpose of this is to have the sines of both net verticals the same to prevent errors in figuring the elevations, and to save space in the notes. The two net verticals should agree very closely.

Elevations are carried underground, 1 by using the transit as a Wye level. (2) by reading vertical angles. The second method is identical with the first when the vertical angle is 00° 00'. To carry a line of levels underground with the transit, the telescope is leveled and pointed to the plumb-bob hung on the point ahead, and the assistant raises or lowers the bob until some definite point on it, usually the top, is intersected by the horizontal wire. A simple code of signals, similar to the signals given in Wye leveling, but made with a light, is used. The H. I. of the transit, which in this work is its distance below the point, and has a minus sign, and the distance of the bob below its point, the 'bob', are measured. The net vertical is the difference between the two. This can be checked by 'setting' the bob at the backsight station and measuring its height. As before, the notes will read as if both sights were made from one station, namely:

Sta.	H. I.	To.	Bob.	Net vert.
4	— 2.13 ft.	5	— 3.13 ft.	+ 1.00
4	— 2.85 ft.	5	— 3.85 ft.	— 1.00

As before stated, the object of a survey is not alone to fix the locus of certain points, but to note sufficient other data that the outlines of the workings may be platted, and accurate sections made. In selecting a system of taking descriptive notes, choose one that will be concise and complete; there should be no ambiguity, and the notes should be such that only one interpretation is possible. Sketches made to the same scale as the working map are highly desirable, in fact indispensable in any but the simplest workings. On the sketch there should be a sufficient number of points located by transit, of 'side-shots', to control the sketch, and fix the position of the most important changes in contour. Side notes are offsets taken from different points along the line of traverse to the sides of drifts, lips of chutes, or to other points. They are taken after the measurement to the foresight has been made, when the transitman walks along the tape, and at any change in the contour, makes a note of the distance from the set-up, and the offsets to the sides at right angles to the tape. Such notes are recorded as 'mixed numbers', the whole number being the dis-

tance from the transit, the numerator the offset to the right, and the denominator that to the left. To make correct sections it is sometimes necessary to take notes to the 'back' and bottom of workings. 'Top and bottom' notes are taken for this, and are recorded as fractions, the numerator being the distance to the back and the denominator that to the bottom. To distinguish them from side notes, they are enclosed in a circle. Unless the contour be a flat curve, side notes should not be taken if the offset is greater than 10 ft., but a 'shot' should be taken with the transit to locate the contour.

The first work to be done on a set of notes on their receipt in the office, is to make the necessary calculations. All slope distances are resolved into their horizontal and vertical components, the latitude, departure, and elevation of each point figured, and the co-ordinates obtained by adding algebraically the latitude and departure of any course to the co-ordinates of the station at the beginning of the course. To avoid errors in these calculations, either one man must make them by two different methods, or two men work separately and check each other. It makes little difference which tables be used, whether they be of logarithmic or natural functions—it depends on the preference of the computer. Any good mechanical computer saves a great amount of time, and where there is much of this work to be done, will soon repay its first cost. An office record should be kept. This should show the course and distance between points, net vertical latitudes, and departures, co-ordinates, with a few brief remarks when necessary.

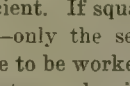
Platting notes direct from the field book or sheets by means of a steel T-square, protractor, and scale, is by far the most rapid method. The position of every fifth point should then be checked by its co-ordinates, and should agree within a foot on a map made to a 50-ft. scale. This is a check on both the platting and the computing. A protractor should be used that is correct to 5 minutes. My preference is for the Browne & Sharpe protractor, reading to 5 minutes on the vernier. It can be set to 2 minutes by interpolation. After a number of points have been platted, and their positions checked, the sides of drifts, and other data, are platted from the side notes, and inked in. The transit points are represented by small circles, with the number of each shown in black, and its elevation shown in red under the number of the point.

Workings not in a horizontal, or nearly horizontal, plane are distinguished by conventional signs, of which there is a multitude. It is to be regretted that there is not more uniformity in this. An opening below a level is shown by shading the upper left hand corner, simulating the shadow thrown by an imaginary underground sun. If the opening be above the level, the opposite corner may be shaded, if it be a raise or major opening. Manways are indicated by a rectangle at the foot, with one diagonal line. If a winze, or shaft, passes through a level, that fact is shown by dividing each compartment with two diagonal lines and inking in the portion below and above their intersection. A solid black rectangle represents the lip of a chute. An incline of any kind may be distinguished by hatching, parallel to the sides, or by short hatching, from the sides, pointing down the incline, and roughly representing the flow of ore or waste. If there be more than one compartment, the manway side is usually left open. Stopes are best platted by showing contours at given vertical intervals, except in a simple fissure vein, when a longitudinal vertical section parallel to the strike is generally sufficient. If square sets are used, the platting is simple—only the sets being shown. Otherwise contours have to be worked up in the same manner as surface contours, by interpolating between points on the walls whose elevations are known. When possible, it is well to plat each floor or contour on a separate sheet of tracing cloth, cut

MODEL FIELD NOTES.

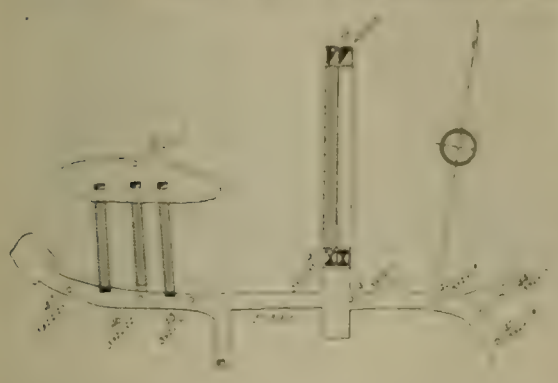
Jany 20-1910 — 400-ft Level — 1"=50'

Def'l	Sta	H I	Vert Ang	S'ope	Course	Hor	To	Vert	Bcb	Net V	Elvn	
	38				S 8°28'E	Backsight	39				400.00	
L 00°02'	39	(-320	44°32'	108.75	S 8°30'E	77.52	40	-76.27	-2.42	-77.05	322.95	Down B'Winze 40 on Sta set on 400 Lev Sta 40 ; B'Winze goes to 500
		(-202	-45.09					-77.93	-2.90	-77.04		
L 22°05	40	-280 / -287			S 30°35'E	21.49	41		-1.84	-0.83	322.12	At east d'f
	41				N 8°30'W	14.00	NE Cor Station					Station 11' wide
	"				S. - - E	13.00	SE -	"				
	"						Floor			-7.10	315.02	
L 66°18'	"	-184 / -178			N 83°07'E	35.25	42		-1.86 / -1.80	+3.02	322.14	Sta 41 ; 10 ; 20 ; 4 Cor Sta
FS L 68°10	"	-184 / -180			S 81°15'W	64.87	43		-1.82 / -1.94	+0.04	322.16	Center of Sta ; Straight on ; 50 ; 23 Chute down 27 Face to 31 ; Sta
FS L 67°25	"	- 184			S 82°00'W	80.50	46		-1.94	+0.10	322.22	At foot of Rs to Stope
L 14°26	42	-180			N 68°41'E	28.32	44		-1.84	+0.04	322.18	16 ; 26 ; 2 Cor Sta
R 27°42	"	-180			S 69°11'E	27.50	45		-1.70	-0.10	322.04	15 ; 2 Cor Sta
R 4°30	43	-194 / -171			S 83°45'W	48.05	47		-2.05 / -1.80	+0.09	322.25	7 Chute ; 20 ; 33 Chute ; Sta
	47				N 62°00'W	27.30	face					11 end of timbers ; 2 Cor & mall ; face
R 86°47	46	-201	+41.21	68.25	N 11°13'W	51.22	48	+45.08	-3.20	+46.27	368.49	Up Rs 3 center Rs ; 2 Cor ; 43 enter stope ; 2 Cor ; Sta in back
	48				S 49°30'W	16.5	¢ chute					
					S 60°00'E	13.2	¢ chute					
					N 11°30'W	4.2	HW Side					
					S - - E	15.0	FW Side					
					S 80°00'E	34.8	End					



to some convenient size and having coordinate lines. On each sheet should be started the excavation of the contour or of the cap of the sets. It requires no more time to keep a set of individual floor sheets platted and by using them the composite map of the mine need not be distracted to monthly progress work—only the extreme boundaries of the stopes would be shown on it.

The accompanying notes show how the different work in the field is recorded, and give specimen sale notes from which the map was made. This is a map of workings in a vein dipping to the south, and entered through a winze or shaft. Between 41 and 42, 20 ft. from 41, is a jog on the left (the terms right and left always mean when looking in the same direction that the traverse was run). To avoid error in platting, when there are two notes on the same side of the line, the rule is to join the first note with the last preceding note, and the second with the next note. Between 41 and 43 is a small cross-cut, which is located by a needle course from a point on the traverse line. In some cases this would be slipshod, but is permissible for short cross-cuts. Prefixed to some of the deflection angles



are the letters 'FS'. This means that the deflection angle was turned without having transited the telescope.

There are a great many advantages in using loose-leaves for transit notes. In fact, after having once used them, a book seems crude in comparison. In making an extended survey, the computers and draughtsmen can use the notes of one day's work the next day, if necessary. They are more easily kept clean, for they can collect but one day's accumulation of mud at the most; consequently they are always as legible as when taken. They are more easily platted, as the sheet being used is the only one necessary to keep on the drawing table, and, unlike a book, does not have to be kept open at the right page with a weight. If they get wet, there is no leather cover to warp when dried. They may be ruled on sheets large enough so that all the notes of a 'shot' may be put on one or two lines, without making too large a book to be conveniently handled in the field or necessitating special pockets in the transitman's coat. Having all the notes of a course on one line makes for rapidity in platting and calculating, and less liability to mistakes. They can be so filed that the notes of each level, or part of the mine, will be separate from other notes, and any intersection about that point can be quickly located. The sheet on which the notes accompanying this article are written is 6 by 14½ in. ruled on one side as shown, waterproof ink being used. The vertical lines on the left side should be red, the horizontal lines green, and the right side of the page, ruled into spaces to the same scale as the working maps—in this case 40 ft. to the inch. They are carried in the field folded along the 'Elevation' column, in an aluminum cover such as is used by expressmen to hold bills. By folding them this way, every column that is used in the field is accessible. The sheet in use is kept first in the cover, so the mere opening of the cover gives access to the right page. In the office, they are filed in covers and indexed in any suitable manner.

PRESENT ZINC-SMELTING CONDITIONS

By R. G. Hall

In September of 1907 practically every zinc-smelting plant, old and new, in the United States was operating at full capacity, two smaller plants were building but not yet ready to operate, and other plants were in prospect or in the minds of promoters. The general curtailment accompanying the panic of October and thereafter in that year caused an extensive closing down of plants and the abandonment of all plans for further construction. Notwithstanding this, the production of spelter for that year set a new record for the United States, 249,860 short tons being produced. This indicated a capacity for production in this country, on the ores proportioned as they were at that time, of close to 300,000 tons. The following table shows the capacity and distribution of the plants at that time:

*ZINC-SMELTING PLANTS IN 1907

Name and Location.	Fuel Used.	Furnaces.	Retorts.
Lanyon Zinc Co., Iola, Kansas	Nat. Gas	15	9000
Cockerill Zinc Co., Iola, Kansas	Nat. Gas	7	4376
Prime Western S. Co., Iola, Kansas	Nat. Gas	14	8564
United Z. & C. Co., Iola, Kansas	Nat. Gas	6	3000
Chanute Zinc Co., Chanute, Kansas	Nat. Gas	8	1600
Granby M. & S. Co., Neodesha, Ks.	Nat. Gas	6	3840
Cockerill Z. Co., Altoona, Kansas	Nat. Gas	6	3840
Edgar Zinc Co., Cherryvale, Kansas	Nat. Gas	24	4800
American Z. L. & S. Co., Caney, Ks.	Nat. Gas	6	3720
American Z. L. & S. Co., Deering, Ks.	Nat. Gas	6	3840
Cockerill Z. Co., Pittsburg, Kansas	Coal	12	2688
Cockerill Z. Co., Nevada, Mo.	Coal	3	672
Cockerill Z. Co., Rich Hill, Mo.	Coal	3	672
Pittsburg Z. Co., Pittsburg, Kansas	Coal	4	896
Bartlesville Z. Co., Bartlesville, Okla.	Nat. Gas	6	3456
Lanyon Starr S. Co., Bartlesville, Okla.	Nat. Gas	5	2880
National Z. Co., Bartlesville, Okla.	Nat. Gas	4	2432
Matthiessen & H. Z. Co., LaSalle, Ill.	Coal	5	4320
Illinois Z. Co., Peru, Illinois	Coal	7	4800
Mineral Point Z. Co., Depue, Illinois	Coal	6	4800
Hegeler Bros., Danville, Illinois	Coal	2	1700
United Z. & C. Co., Springfield, Ill.	Coal	2	1280
Sandoval Z. Co., Sandoval, Illinois	Coal	4	896
Edgar Z. Co., St. Louis, Missouri	Coal	9	2016
New Jersey Z. Co., Bethlehem, Pa.	Coal	3	672
New Jersey Z. Co., Palmerton, Pa.	Coal	12	2400
Bertha M. Co., Pulaski, Virginia	Coal	10	140
Grasselli C. Co., Clarksburg, W. Va.	Nat. Gas	10	5760
United States Z. Co., Pueblo, Colo.	Coal	6†	2074

*'The Mineral Industry,' Vol. XVI, p. 899.

†Muffles, figured to the equivalent number of standard round retorts.

An analysis of this table gives the following proportion of smelting capacities, and appended is shown the percentage of metal produced in 1907:

	Capacity. Per cent.	Metal in 1907, Per cent.
Kansas gas smelters	51.0	52.0
Oklahoma gas smelters	9.6	2.0
West Virginia gas smelters	6.3	8.0
Kansas & West Missouri coal smelters	5.4	4.0
Illinois & East Missouri coal smelters	22.0	23.5
New Jersey-Virginia coal smelters	3.5	8.5
Colorado coal smelters	2.2	2.0

These figures of capacity and production are of course somewhat arbitrary but are substantially correct for 1907. Oklahoma production was low as the plants were not all completed and operating in 1907. In 1909 the production of spelter was approximately 267,000 tons, produced in about the following proportions by the various plants:

	Metal in 1909, Per cent.
Kansas gas plants	38.8
Oklahoma gas plants	10.7
Illinois & East Missouri coal plants	31.3
N. J.-Va. & W. Va. coal plants	17.0
Colorado coal plants	2.2
Kansas & West Missouri coal plants	...

At the present time there are in operation in the Kansas gas belt approximately 19,000 retorts equivalent to 40% of the capacity of plants in that district. In the coal fields of Kansas and western Missouri not one furnace is operating. The balance of the country is operating on about the same capacity as 1907 and 1909. Some slight increases in capacity have been made in West Virginia and Oklahoma, but they are recent and are probably not yet operative.

The conditions precedent to this state of affairs, so disastrous as regards Kansas and Missouri, are of course quite plain—shortage, both of gas and of smelting margin. In the Iola district the works are productive to only about 20% of their capacity, and further decreases may confidently be looked for on the approach of cold weather, not alone in the Iola field but over the whole of the Kansas gas belt. Predictions are dangerous in such an uncertain matter as that under discussion, but most people in the business expect that fully 50% of the capacity of the plants now operating in the Kansas gas belt will be shut down by January, or at latest March, and the gradually increasing cost of gas will cause the microscopic smelting margin of the remainder to go the way of the Kansas gas fields. The diminishing smelting margin clearly is largely to blame for the present condition and for receiverships for companies representing 40% of the Kansas-Missouri district. Our 'black sheep', the tariff and 'Uncle Joe', have of course a measureable amount of blame to bear, inasmuch as the duty on zinc ore (raw material) was raised from nothing, to a rate equivalent to about 1¼c. per lb. of metal recoverable, while the duty on metal imported as such, was lowered to the same figure of 1¼c. per lb., leaving no protection to the smelter. The ore producers of the Joplin district have not been slow to use the advantage given them, as by their close combination they are able to do, while imports of spelter are constantly threatened.

Prospecting for natural gas becomes daily more expensive, and the profits with which that prospecting could be done are vanishing. Only in the more recent fields of Oklahoma is there enough gas at any point to operate comfortably. In Oklahoma the smelters are drawing gas by contract from fields apparently still in their vigor, but the exhaustion of Kansas gas is driving the companies supplying domestic and other higher priced consumers into that field so that as far as smelting is concerned the Oklahoma supply, too, is within measurable distance of exhaustion.

These views may seem pessimistic, but the facts themselves are sufficient without any predictions to show that on a normal consumption of spelter the production is today too small. Consumption is at present quite below normal as is the consumption of steel products and in fact of practically all common metals. Any resumption in business must find the smelting capacity inadequate to meet the demands and increase of prices would result. Whether an increased demand for spelter will result in an increased number of plants at other points where fuel may be obtained is a question for the future. It must be remembered that in the coalfields east of the Mississippi, which alone seem available for smelting the Western ores, it will be necessary to manufacture sulphuric acid from the roaster gases in order to avoid damage suits. The cost of a plant capable of working under these conditions becomes at the start almost prohibitive except for the strongest financially, while the possibilities of profit are pretty slender on by-product acid in a field already over-supplied; and besides, as shown above, the financial experiences of the past three years have not been such as to invite further investment of capital in this branch of industry.

In the meantime, with no great increase of ore production probable from the Joplin field even at higher figures than now prevail, and with Mexico and British Columbia practically shut out by the tariff, it would seem that the markets of the miner of zinc ore in the West are secure. Western zinc ores notwithstanding their complex character and metallurgical difficulties, are today selling almost on a parity, considering their percentage of metal, with Joplin ores. Many lead and precious-metal mines formerly unprofitable because of the zinc content of the ore are today deriving a large part of their revenue from the sale of the zinc product alone, and properties as far west as western Arizona, Nevada, and Idaho, are shipping zincblende and calamine, both concentrated and crude to the smeltes of Kansas at profit. With the great improvements of recent times in the methods of concentrating the complicated ores of the Rocky Mountain States, and the increasing skill of the zinc smelter in handling the concentrate, it would seem that the prospector has added another mineral to his list and the once despised 'black jack' may be given hereafter a hearty welcome.

The Ohio Concentrator

By Lucien A. Parsons

The concentrator of the Ohio Copper Co. is situated over the mountain from Bingham, Utah, at the town of Lark at the portal of the Mascotte tunnel. The millsite embraces 1480 acres with a sloping hillside, simplifying to some extent the construction of the mill, and a broad flat which allows of ample room for tailing for many years. The plant, which is about half a mile from the tunnel, embraces two buildings, 'the mill,' as it is locally called, and the 'slime plant.' Both buildings have steel frames on concrete piers with a sheathing of heavy corrugated iron. They are lined with building paper over which is a layer of asbestos held in place by poultry netting. This makes the buildings warm, though in winter they are further heated by hot water carried in four-inch pipes. The walls are well supplied with windows, and in the mill are two rows of seven skylights. These are gabled so that the light from above

Main Mill Building.

strikes directly into the mill instead of from the side. The floors are of concrete with false floors of wood for the comfort of the operatives. Wherever possible all line-shafting is so placed that the belts are well out of the way and the motors are on platforms eight or ten feet above the floor. The line-shafting is readily accessible by means of broad runways which are guarded by hand-rails. The machinery piers are of concrete, and, in the cases of the tables and Chilean mill, are built well above the floor so as to allow plenty of room beneath. A railway switch runs in front of the concentrate bins and another for the handling of supplies and repair parts is at the back of the mill. A 24-in. track for push cars runs to the supply track, and by means of this the heavier repair parts are taken into the building to a point where they can be picked up by the cranes and transported to any point. The slime plant is at one side of the mill and sufficiently low to permit of gravity feed. The distance between the two is such that if the capacity of the mill is doubled, as it may be at some future date, the two buildings will adjoin. The mill building is 317 ft. long and 391 ft. deep in the direction of the flow, and the slime plant is 342 ft. long and 115 ft. deep. The buildings are completed, but only one-half of the machinery is installed and in operation. The original design was for a mill of 2240 tons daily capacity. This has been slightly exceeded, as during a recent month, the one-half in operation put through 1146 tons per day allowing for all shut-downs and delays.

The mill is divided into two units, each of which is further divided into two sections, one complete unit now being in operation. The ore is a finely disseminated chalcocite and chalcopyrite in a gangue of quartzite. It is brought from the mine through the Mascotte tunnel in trains of 20 five-ton cars over a trestle and dumped into the crude-ore bins, of which there is one with a capacity of 2000 tons to each unit. The ore-bins have steel frames and are constructed of a double thickness of two inch plank with flat bottoms, the latter being cheaper to build and to maintain than the sloping bottoms. In the front of each bin are six gates, one near the centre feeding direct to the crusher, while the feed from the others is delivered by a 24-in. belt conveyor running from each end.

The ore is mined by the caving system and breaks quite fine so that the first crushing can be made to $1\frac{1}{4}$ in. This is done in a 16 by 24-in. Blake crusher set on a platform 20 ft. above the floor proper. The ore goes from the bin over a $1\frac{1}{2}$-in. grizzly and the oversize passes through the crusher. The crushed ore with the grizzly undersize goes to a 3 by 6-ft. trommel with $1\frac{1}{4}$-in. punched holes, at which point water is introduced. The trommel oversize divides, going to two 20 by 6-in. Blake crushers which reduce it to $\frac{3}{4}$ in. Each crusher discharges to an elevator which dumps to a 100-ton feed-bin with sloping bottom, there being one such bin to each section. A 75-hp. induction motor drives the coarse crushers of each unit and all feeders, elevators, conveyors, etc., connected with them. One unit of the mill is served by the coarse crushing plant as described, but the following description will be understood to apply to only one section or one-half a unit.

From the feed-bin the ore goes to two 3 by 6-ft. trommels with ½-in. punched holes. The oversize of these trommels goes to a set of 15 by 36-in. Gates high-speed rolls set to one-half inch, making 104 r.p.m. The roll product goes to an elevator which returns it to the trommels. A 35-hp. motor drives the coarse rolls, trommels, and elevators. The undersize from the $\frac{1}{2}$-in. trommels goes to four 3 by 6-ft. trommels set in pairs, with ¼-in. punched holes. The oversize from each pair goes to a set of Gates rolls of the same size as the coarse rolls set to ⅛-in. and making 102 r.p.m. Each set of rolls discharges to an elevator which returns its product to the fine trommels. Two 50-hp. motors drive the fine rolls and attendant machinery. The roll-shells are of Latrobe steel and have a life on the coarse rolls of six weeks and on the fine of six months. The undersize from the four fine trommels flows by gravity to the feed-bin for the Chilean mills. At the discharge from the trommels it is sampled by a rather novel sampler, consisting of a sheet-iron bucket 12 by 8 by 1 in., which is carried through the stream on a belt and then automatically inverted.

The test runs, on the basis of which the mill was

designed, showed a considerable amount of ore that would jig, but when the time came to put the mill in operation the ore that was provided was found to be too fine for this purpose so that the jigs that were installed have been of no service. This has necessitated a modification of the system, and the final design has not yet been adopted. The original plan was to classify the ore before it went to the jigs, and re-grind the tailing. At present in one unit the trommel undersize goes directly to the feed-bin for the Chilean mills and from them to the distributer for the table classifiers. In the other unit it is first passed over a traveling belt screen and the oversize sent to the mills which discharge as above. A third plan which is to be tried is to remove the screens from the mills and re-grind the oversize from the traveling screen. The mill product will be returned to the traveling screens by an elevator and re-classified. The undersize of the traveling screens will go to the distributer.

Each section has four 7-ft. Monadnock Chilean mills set at corners of a square. The mills make 24 revolutions per minute with four mullers. The tires are of Midvale steel with a face of 10 in. and a thickness of 4 when new. They have a life of five months. The screens are 16-mesh brass wire with a free opening of 0.025 in. The mills are set well above the floors on concrete piers so that the under mechanism is readily accessible for repairs. A 150 and a 50-hp. motor drive the mills. The mill discharge runs by gravity to a revolving distributer that divides the feed among the classifiers for the tables. The launders leading to the tables terminate in a tub 48 in. diam. Inside of this tub is a cast-iron cylinder with a spout driven by an overhead gear. The cylinder receives the feed, and in revolving discharges it to each launder in turn. On the table floor are 54 tables arranged in six rows of nine each. One row of James tables was installed, but after a try-out they were found to be unsuited to this ore and are not now in operation. At the head of each row of tables is a series of classifiers each of which feeds two tables. Each classifier is 15 ft. 8 in. long, 4 ft. 9 in. deep, 4 ft. 6 in. wide at the top, and 1 ft. 6 in. wide at the bottom. The pressure water is turned in at the bottom, the arrangement of hydraulic and discharge opening being similar to a spitzkasten, but there are no compartments in the classifier. The overflow of the classifiers runs to the slime plant.

The tables are a combination of two of the better known models of the Wilfley, having the deck and adjustment of the No. 5 and the head-motion of the No. 3, the latter being slightly modified by placing the spring under the toggles instead of under the deck. The No. 5 deck is self-contained and sets well above the floor so that it can easily be reached from beneath, while the No. 3 head-motion is considered the simplest and is the one preferred by many millmen. This combination has given excellent satisfaction. The tables have a speed of 250 strokes per minute, those treating the coarser feed being set to $1^1/_{16}$ in. and the finer to $\frac{7}{8}$ in. The first six rows make four products, concentrate, middling, tailing, and slime. A 20-hp. motor drives each double row, 18 tables. The slime goes to the slime plant, the tailing is rejected, the concentrate goes to a set of finishing tables, and the middling to classifiers on the level next lower than the main table floor. These classifiers, which are similar to those described, feed a row of nine tables which make three products, concentrate, tailing, and middling.

All concentrate runs to classifiers on the lowest floor of the mill to nine finishing tables making only two products, concentrate and middling. The ore is of so low a grade and the silicious content is so high, that it is impossible to make in one operation a product that will not run high in silica. The concentrate from the first operation assays as high as 35% SiO_2. By the finishing operation this silica is brought down 10 or 15%. As the valley smelters penalize silica and pay for iron at the rate of 10c. per unit, it will be seen that the finishing process is a paying one, equaling a reduction in the cost of milling of from 4 to 6c. per ton crude. As there is no reject from these tables there is no increase in the tailing loss. Another advantage is that the finishing of the concentrate in a second operation permits of a certain amount of crowding on the roughing tables which can be accomplished without any increase in the loss in the tailing, as it is not necessary to remove all of the silica in one operation, and the tables can be run flatter than is customary. This results in a closer saving with an increase in silica, the latter being removed in the second operation. The finishing also makes a reduction of 10 to 15% in the amount of the concentrate, with a corresponding saving in smelting charges.

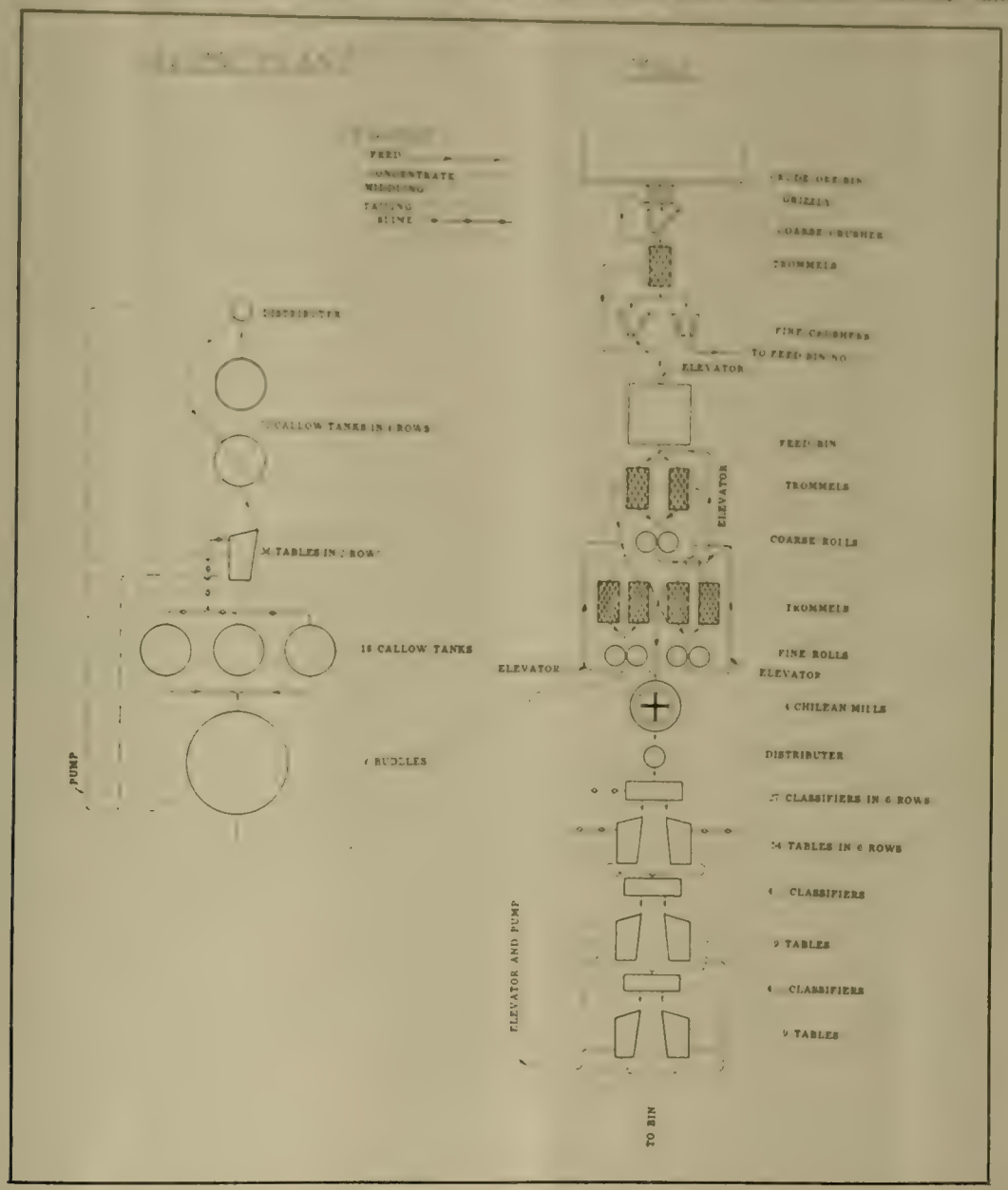
The middling from the middling and finishing floors flows to an elevator by which it is raised to the top of the concentrate bins, from which point it is returned by a 4-in. centrifugal pump direct-connected to a 15-hp. motor to the feed-bins at the Chilean mills. The concentrate goes to an elevator which raises it to the bins. A 25-hp. motor drives the finishing and middling tables and concentrate elevator.

The bins are in an addition to the mill proper, in which a railway spur is so placed that the concentrate can be loaded directly into the cars. There are two bins to each section, so that one is draining while the other is filling. This makes eight concentrate bins arranged with four bins on each side. There are five overflow bins. The bins are 16 by 16 by 16 ft. tied by 1½-in. rods. The overflow runs to the nearest overflow bin and the fine particles of concentrate have a chance to settle. The stream overflows in turn to the next bin, and finally to the one in the middle. The overflow of this bin is used as wash-water on the middling and finishing floors. Each concentrate bin has a fine screen 12 in. wide covered with two thicknesses of burlap set diagonally across each corner for the full height of the bin. When the bin is full, plugs are pulled from the corners and the water in the concentrate is drained through the screen. When the bins have been emptied the screens are washed off with a hose. The bins are rendered watertight at the gates by means of a rubber gasket against which the gate is tight-

ened by a cam. Tailing and concentrate are sampled by water-operated tooter samplers. The tailing from both units mingle in one large launder and run to the tailing pond.

The slime plant is built in two floors and two units. One of these is in operation and will be described. The feed consists of the slime from the tables in the mill and the overflow from the table classifiers. This slime has to be pumped by means of a centrifugal pump to the distributer above, which was finally accomplished by running the pulsator above center. This was tried with some doubt, as it was expected that the heavy sections would pound themselves to pieces, but no trouble has been experienced from this source and the experiment has proved satisfactory. The stroke is about one half inch.

These tables make concentrate, middling, tailing,



Flow-Sheet Ohio Concentrator.

runs to a large revolving distributer which divides it among three smaller ones, each of which feeds 24 Callow tanks, a total of 72 tanks being arranged in two rows on each side of the table floor. There are two rows of Wilfley tables, 18 in a row, and each table receives the spigot discharge of two Callow tanks, the overflow being used as wash-water. These tables make 250 strokes per minute, and the stroke on so fine a feed must of necessity be very short. Some trouble was found in getting it sufficiently and slime. The concentrate goes to an elevator belted to a 20-hp. motor, by which it is raised to a bin similar to those in the mill. The middling goes to a 4-in. centrifugal pump direct-connected to a 15-hp. motor, and is returned to the main distributer. The tailing is rejected and the slime goes to 18 Callow tanks on the lower floor.

Each three of these Callow tanks feed a 16-ft. single-deck buddle. The deck of the buddle is laid on an umbrella frame of eighteen 4 by 6-in. timbers

and is braced by a like number of the same size slanting downward to the spindle. The deck is covered with neat cement with an outward slope of 1¼ in. to the foot. The table makes one revolution in 70 seconds, being driven by an overhead worm gear. The buddles make concentrate, middling, and tailing, each of which is washed off into a separate compartment. The concentrate goes to the elevator, the middling to the pump, and the tailing is rejected. The revival of the buddle, which many millmen have considered obsolete, is rather interesting. The feed, it will be noted, is the slime from tables which treat the slime of the mill; an impalpable pulp in which absolutely no grit can be noticed and all of which will pass a 300-mesh screen. It was feared that so fine material would not settle to the belt of a vanner, so the buddle was tried, and, according to the statement of the management, has been found to give as good results as could be expected on so fine a feed. Two 20-hp. motors drive all of the concentrating machines in each unit, and one 20-hp. motor the two elevators in the bin-room. A sump in the concentrate floor has been provided near these elevators in which any slop may be collected and settled. Concentrate and tailing are sampled by water-operated 'teeter' samplers.

The tailing is held behind an earthen dam and the surface water at the end farthest from the point of entrance is led to the pump-house. Here are two 12 by 12-in. single-acting Aldrich triplex pumps with a capacity of 1000 gal. per minute, each geared to 100-hp. Westinghouse induction motors, with provision for the installation of two more. These raise the water against an equivalent head of 250 ft. to the mill. The pipe is 24-in. wood, iron-stayed except for the last 320 ft., which is of iron.

A summary of the motors that will be used in the completed mill follows:

Machines.	No. motors.	Hp. each.	Total hp.
2 coarse and 4 fine crushers, elevators, 2 trommels, 4 conveyors	2	75	150
4 coarse rolls, 8 trommels, 4 elevators, 4 feeders	4	35	140
8 fine rolls, 16 trommels, 8 elevators	8	50	400
16 Chilean mills	4	150	...
	4	50	800
216 roughing tables	12	20	240
36 middling tables, 36 finishing tables, 4 concentrate elevators, 4 middling elevators	4	25	100
4 middling pumps	4	15	60
144 tables, 12 buddles in slime plant	4	20	80
2 middling pumps in slime plant	2	15	30
2 concentrate elevators in slime plant	1	20	20
4 1000-gal. return-water pumps	4	100	400
			2420

This number, 2420, divided by 2300, the capacity of the mill, gives 1.05 hp. per ton of ore treated.

The company buys hydro-electric power generated by the Telluride Power Co., but is supplied by the Utah Light & Railway Co. instead of direct, as the latter company has an excess. It is found more economical to buy the hydro-electric power than to build and operate a steam-electric plant. In the transformer house at the pumping station are three 100-kw. Westinghouse oil-water cooled transformers, stepping down from 44,000 volts to 480, with choke coils and lightning arresters. In the main transformer house at the mill are three similar transformers of 500-kw. capacity, three 44,000-volt choke coils, and lightning arresters. The oil switches are encased in concrete boxes with metal doors and the trunk lines are provided with time limit relays at the switchboard. All motors except those at the pumping plant are three-phase, 60-cycle, induction of General Electric make. The pumping motors are Westinghouse.

Under one crude-ore bin is a repair shop, and under the other a machine shop, where the work of the mine as well as the mill is cared for.

The water used is derived from the Mascotte tunnel, which gives a flow of 600 gal. per minute. The mill uses 4500 gal., the remainder being recovered. This high recovery is effected only by saving all that is possible, and the only water lost is that which evaporates and that remaining in the concentrate after it has been drained. About 18 tons of water is used to each ton of ore treated.

During the month of June the average amount milled was 1146 tons per day. Concentration was effected at the rate of 26 to 27 tons into one. The average of the ore is about 1.4% copper, and the extraction is 65%. The ore being treated is that which comes from close to the capping. It is lower in grade than the average run of the mine and contains a great deal of carbonate on which the extraction is poor. With a better grade of ore the extraction should improve, as within certain limits the loss does not increase at the same rate as the percentage of copper. With the ore taken from greater depth, where the carbonate no longer appears, there should also be an improvement in extraction. The average of the concentrate is somewhat better than 24% copper, and the production at half capacity at the rate of 7,500,000 lb. per year. With an ore running 1.75% copper and an extraction of 70%, both of which, if apparently reliable reports are to be accepted, are possible, the production would go well in excess of 10,000,000 lb. per year. The concentrate is being shipped to Garfield for smelting and converting. While, in view of the threatened competition at Tooele, the contract is supposed to be a favorable one, the company does not desire to make a statement of costs while operating at only part capacity. Production should be accomplished at a reasonable figure, as the ore can be mined and milled cheaply, but there is no doubt that a recent unofficial statement which placed cost of production at 7½ to 8c. per pound was far too optimistic. The writer wishes to acknowledge the courteous assistance of William A. Kidney, superintendent of the mill, in collecting the notes for this article.

The lead and zinc mines of northern Illinois are all in Jo Daviess county, the extreme northwest county of the State. The ores have the same structural relations as in the upper Mississippi district generally; that is, they occur disseminated through dolomite, or in openings called 'crevices,' 'pitches,' or 'flats,' depending on their attitude to the horizontal.

Water Conditions in the Oil Field at Coalinga

By R. P. McLaughlin

Within the past few months considerable publicity has been given to the troubles experienced from water in the oil wells of the Coalinga, California, oil field. A definite statement of conditions and causes of the publicity will doubtless clear up some misconceptions. The last Legislature passed a law authorizing the appointment of Oil Well Commissioners by the supervisors of various counties. The duty of the Commissioner is to investigate the cause of trouble in wells that are flowing a high percentage of water and damaging surrounding properties, and to correct such errors if possible. Such a law is very easily written upon the statutes but the difficulties of enforcement are twofold. First the owners of the offending well may be indifferent to the damage being done or financially unable to correct it, and second, the problem may be extremely difficult to solve owing to unexpected conditions underground.

In Fresno county the salary of the Oil Well Commissioner is paid entirely from the county funds and amounts to $100 per month. As the rate of pay of skilled laborers in these oilfields is in the neighborhood of $175 or $200 it can be seen that the Commissioner has an individual problem in domestic economy, especially if he attempts the necessary traveling in discharge of his duties. In view of the above mentioned difficulties the results obtained have not been great. The present Commissioner, R. Baker, has done as much as was possible and the board of supervisors has shown a willingness to give more help to the oil producers if some practicable scheme were presented and supported by them.

Several months ago the Commissioner called a meeting of those interested and after considerable discussion a committee of eleven was appointed to draw up a plan of co-operation. A scheme was presented for the formation of an association of all the operators through which such information as is necessary could be collected. An office was to be maintained in the town of Coalinga, a geologist employed with such assistants as he should need, and power delegated to the executive committee of the association to enforce remedial measures. The proposed articles of agreement were submitted to the officers of every company in the field, with requests for suggestions as to improvement, acceptance, or rejection. Practically no objection to the scheme developed though there were some suggestions as to alteration of details. The number of replies was so small, however, that the organization was not assured. Steps have since been taken to obtain direct answers from the companies through their various resident superintendents. The matter is in the peculiar condition of having met no opposition and being generally approved by most of the people aware of the conditions, and still the committee lacks power to proceed. It has become evident that corporations are loath to delegate power to any committee to dictate as to the conduct of operations at any well. Considerable doubt as to the power under the present law to really accomplish anything is also manifest. Most although not all of the operators concede the advisability of having data collected and presented in the form of cross sectional drawings of the logs of wells.

The total estimated cost of the scheme would be equivalent to a charge of about one mill per barrel of oil produced. The plan provides for a geologist who would watch the drilling of all new wells and thereby be able to correlate the logs. The sum estimated would permit employment of competent and experienced men for this work. At present the logs are kept by different individuals without attempt to strictly classify the formations passed through and are frequently of no value aside from showing the depth at which oil is found. Water is rarely mentioned in the written logs though it is a most important item. The upper portion of the logs has been considered of little value and such strikingly characteristic beds as gravel or large fossils are seldom recorded. These would, if systematically recorded, afford enough data to almost exactly tie neighboring logs together and give a basis for predictions during the drilling of any well. Many logs are recorded merely from what can be observed by the driller within the derrick. This should be supplemented by careful scrutiny of all the drillings dumped. Some of the larger companies, especially the K. T. & O. (Southern Pacific company), follow such a scheme as outlined and thus have accurate records of all work that may be readily shown by drawings.

The Coalinga field is probably one of the most simple in structure and regularity of beds, and more good could thus be accomplished by co-operation here than at many other places. Water conditions are far from being hopelessly bad and the field has not shown any evidence of general encroachment of water. Water is frequently carried in a bed above or below an oil-sand and unless carefully handled and cemented off leaks into the oil sand. In some cases enough water is found to entirely smother or hold back the oil, while in others only a small percentage comes in with the oil and settles out in the sump-holes. One company is pumping oil with water in such fine globules that it will not naturally settle and requires electric treatment. There have been about 1000 wells drilled in the field, about 30 show water in amounts greater than 25%, while about 50 wells have been abandoned. Not all of the abandoned wells are chargeable to water troubles but probably a majority are and as the cost of drilling a well will average about $20,000, it will be readily seen that lack of system has already cost a considerable amount. As is usual in any new departure the value of technical work is looked upon with considerable skepticism by those who have heretofore obtained creditable results from 'rule of thumb' methods. However, the subject is in the way to be given thorough consideration and perhaps a fair test.

Mining Industry in Japan

By T. Haga

The total number of applications for mining rights in 1909 amounted to 4335, a decrease of 326 or 7% as compared with 1908. This was chiefly due to decrease in applications for prospecting; there was some increase in applications for working rights. In 1906 and 1907 the applications for prospecting increased remarkably in accord with the general boom in all enterprises and the rise of mineral prices. Since 1908, however, they have gradually decreased, on account of the depression of business and the fall of mineral quotations. At the end of 1909 the number of mine-lots granted for prospecting was 4037, a decrease of 1149 or 22%, and the number of commissions for working was 5553, a decrease of 21. Alluvial mine-lot concessions in 1908 numbered 1608, a decrease of 699 or over 30% over the number in 1907. Since 1908 there have been numerous cancellations at expiration and fewer applications. The working mine-lots, though not increased in number, do show increases in area year by year. In alluvial mining the output in magnetic sand did not show any remarkable change though a number of concessions were cancelled in 1908. The output in alluvial gold increased remarkably, particularly since its discovery in Hokkaido. Owing, however, to the imposition of an extraordinary tax, it decreased nearly half and still shows a decrease year by year. In 1909 the staple mineral products, gold, silver, copper, iron, and sulphur (with the exception of those of the naval possessions and Formosa), showed an increase of 7 to 20% and coal and petroleum showed an increase not less than in the year before. The production of the staple minerals for the past ten years has increased year after year steadily and in case of silver, copper, coal, and petroleum, the rate has been remarkable. The output in 1909 of gold and silver in comparison with that of ten years ago, 1899, shows an increase of 90%; silver, iron, and petroleum increased 120, and coal 100% in the same decade.

In the aggregate the trade in minerals of 1909 was Y96,450,213, exports being Y43,221,316 and imports Y53,228,897. The excess of imports was Y10,107,581. There was an increase of Y278,760 in the value of the exports, and a decrease of Y14,846,675 in the value of imports as compared with 1908. In short, the figures show a decrease of Y14,567,915 in the value of both exports and imports. The total volume of exports and imports in minerals amounted to a little over Y82,260,000 in 1905 but suddenly reached over Y103,960,000 in 1906 and over Y126,250,000 in 1907. Since 1907 there has been a slight decrease, yet the total amounted to over Y96,000,000 in 1906. The principal of exports are copper, coal, and sulphur. The exports of copper for 1906 to 1909 amounted to over Y22,790,000 per year; those of coal to Y17,920,000, and of sulphur over Y1,140,000. They all show increases year by year. The principal imports are iron, steel, petroleum, and phosphates. The imports of these articles are decreasing, especially imports of iron and steel.

Investment in mining during the past five years, 1905-1909, aside from that of individuals, shows an increase both in the number of companies and in capitalization. The number of companies was 233 in 1909, as against 195 in 1907, and 132 in 1908. The total registered capital amounted to over Y181,300,000 in 1909 against over Y171,000,000 in 1907; an average increase of over Y80,000,000 or 22.7%. Market quotations in 1909 were constantly inactive. The prices of all the minerals showed decreases but compared with the previous year, the amount of fluctuation was small and at the same time there was no great difference in quotations. During the last half year, the tone was upward, and still active at the end of the year. The coal market was affected by the general commercial and industrial depression, and stocks accumulated. The price of coal fell from 12 to 5%. The decrease was especially remarkable in Tokiwa and Karatsu districts. In all Hokkaido districts the price was much depressed, but the most famous Chikuho district was steady. The petroleum market, which has been active for years, in 1909 became suddenly dull, and still is so. During 1909 the disasters in mines number 14,489, which resulted in 554 deaths, 229 seriously wounded, and 14,254 slightly wounded. The number of deaths showed an increase of 239 in comparison with 1908, due principally to a great disaster at Oura coal mine, Fukuoka, in which officials and miners killed, numbered 243.

It is claimed by some mill-men that a mill of the Chilean type does not work to its highest capacity if run at high speed—60 to 80 revolutions per minute—as in this case the pulp partakes of the rotary motion of the crushing wheels, and the latter do not, in consequence, overtake the granules of rapidly rotating pulp as effectively as where the mill is run at slower speed. A speed of 360 to 400 ft. per minute is thought to be correct, by those who advocate slow speed. This is a matter that may be determined easily by careful experiment.

Not longer than ten years ago it was considered the proper thing, in order to increase the duty of the gravity stamp, to place some sort of auxiliary crushing device between the rock-breaker and the stamps. This was usually either a second crusher, reducing the rock to still smaller size, or a set of crushing rolls, to re-crush the oversize from the first breaker. Today it is almost universally the practice to re-grind after the stamps, as it has been found the desired fineness of pulp can be produced less expensively and more evenly by the latter method.

The first electric-transmission plant for mining in California was installed at the Big Bend mine on Feather river in 1888, and the second at the Dalmatia mine in El Dorado county, in the latter part of the same year. These lines were both short—a mile or two. The Standard Consolidated mine plant at Bodie, California, was twelve miles or more in length and was built in 1893. This was the first of what might properly be called long-distance plants for mining enterprise exclusively in California.

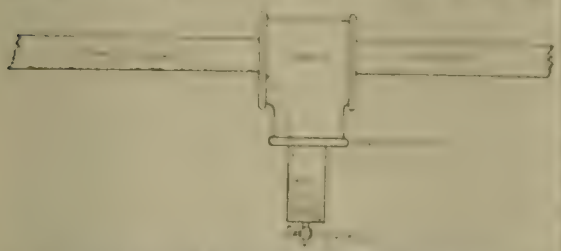
Discussion

[illegible]

Device to Free Air-Line of Water

The Editor:

Sir—Having had considerable trouble with water in the air line I was told by a friend to try the following described scheme and found it to work successfully, and have had absolutely no trouble from that source since. The device is easily and quickly made, costs but a trifle and has given entire satisfaction. Take a common 'T' twice the size of the



air-line, or at least larger than the air-line, screw in a nipple 12 to 18 in. long, to provide a well for the condensed water, fit the nipple with a pet-cock, or valve, at the bottom end to blow out the water which collects in the well, screw this onto the pipe-line, and extend the line on to the drill. All water collecting in the pipe or air-line drags along the bottom of the pipe and drops into the well, and by blowing the well out occasionally, all trouble from that source is overcome. It is best to have this device as near the drill end of the line as possible.

A. L. Lamb.

Ashland, Oregon, July 30.

Cyanidation of Sulphides

The Editor:

Sir—This is not only a subject of interest, but of importance to the mining world. For the last seven years I have studied and experimented along these lines, meeting with encouraging success. In some cases results were almost unbelievable, in fact disputed, but I produced the bullion at the 'clean-up' which corresponded with assays, and that is, after all, the most convincing argument. I do not claim to have discovered a new process, but the successful application of the bromo-cyanide process. At three different well known mines where I have installed plants, different treatments are in vogue. The same strength of solution and quantity of bromine does not apply to all sulphides, but, like treating different tailings, a specific treatment is of course essential.

I shall only cite in this letter the treatment I employed on the concentrate at the Black Oak mine, Tuolumne county, California, in 1905; this being the most interesting on account of the high content of gold and silver. The concentrate contained sulphide of iron (pyrrhotite), galena, and copper. Occasionally the content of galena ran as high as 4%, but the copper never exceeded 2, and was generally [illegible] The silver was mostly in the form of a sulphide. There was about 3% of sulphide in the ore which when concentrated represented six different products ranging in value of $100 gold, 20 oz silver to $2000 gold, 160 oz silver per ton. Only about 400 lb. of the latter product was made each month. It was all cyanided and turned into a tail averaging an extraction of 99%, and over on 30 tons a month's run, at a cost of $5 to $8 per ton the cost depending on the value of the tailing. The Frue vanner product (designated as No. 1), was the coarsest material treated and showed beyond all doubt the advisability of fine grinding, for, on comparing the tailing value with that of the tailing from other products treated which were finer, the No. 1 tailing always ran $1 to $2 higher. While these were the coarsest treated they could be considered fine in comparison with the average of concentrate, for the mill crushed to 60-mesh. The average value of No. 1 concentrate was $100 gold, 20 oz silver per ton.

The treatment began at the machine where concentrate was produced. If at the vanners, the sulphides were hoed out into the front settling box, and let stand for eight or ten hours. Every half hour during that time they were pounded with a shovel. They gradually packed and settled under this treatment, so that at the end of eight hours they were very hard and solid and contained only 12 or 14% moisture. The water was then bailed off and sulphides shoveled out. The product is easier to handle, there is less loss, no extra cost, and this method is to be recommended on the ground of its neatness alone. On the accumulation of 3000 lb. or thereabout, the concentrate was trammed to the cyanide plant, spread out in the sun, and dried to about 2 or 3% moisture. Winter conditions, of course, interfered with this treatment, necessitating the discarding of this preliminary operation which always resulted in a little higher tailing loss. Steam drying improved this a little, but nothing we could do would bring extraction up to that on a sun-dried charge. My theory for this is that the sun in drying out the moisture, split or fractured the particles, making them more porous, and the sulphides took up more or less oxygen in drying, and being dry, helped the solution to penetrate by absorption. The charge treated by agitation, consisted of 3000 lb. net weight (carefully weighed, moisture determined, and sampled for 'heads' assay), 2000 lb. net weight of water (solution), about ½ lb. of liquid bromine, and 40 lb. of cyanide (2% solution).

The agitation tank is of special construction. It should be of steel in preference to wood, or wood, steel lined. In fact steel should be used instead of iron, wherever a wearing surface comes in contact with pulp. I advise the use of steel shoes and dies in all mills where cyanide is used. A higher extraction and less cyanide consumption, is my experience. The agitator used was made approximately air-tight, so as to have the charge, while agitating, under a slight air or gas pressure. It has a trap door in the top for the convenience of loading.

After sulphides and water are in the agitator the bromine was added and the trap door closed imme-

diately to retain fumes which, while heavy, would soon be fanned out and lost. I believe these fumes perform just as much work as the liquid dissolved in the water. The charge was agitated a half hour before cyanide was added, and the air started, putting the charge under a slight pressure which was maintained during the whole of the agitation. About four hours after adding cyanide the largest consumption had taken place. The extraction at that time was about 90%, 18 hours more being required for the remainder. At the end of the 22 hours' agitation the charge was discharged into a rectangular vacuum tank, and then solution was drawn through the filter, leaving the sulphides, with about 20% of the pregnant solution. This was displaced by wash-water. On being thoroughly washed the tailing was sampled for assay, and then shoveled out. Seldom more than 30 of the 40 lb. of cyanide would be consumed; more often 20 lb., sometimes as low as 10 lb.—this depending altogether on the quantity of magnetic iron present, and the amount which went into solution. The gold was invariably extracted regardless of large or small cyanide consumption. The silver was always more or less of a worry. If the cyanide consumption was small at the end of the 22 hours, the silver was always extracted. If cyanide was nearly all destroyed, the solution would be dark, and the silver lost. This seemed to be due to the iron going into the solution and precipitating the silver. This could only be avoided by constant vigilance toward the end of the treatment as it was at that stage the trouble would occur if at all. The average tailing value on No. 1 sulphides when not sun-dried before treating, was $2 gold, 2 oz. silver per ton. These same sulphides sun-dried, averaged $1 gold, 1 oz. silver per ton.

The other products were treated in much the same manner with about the same strength cyanide and bromine. Although much richer they were easier to treat. The reason for this was their extreme fineness. No. 2 product, which was caught on the canvas plant, ran $250 gold, 50 oz. silver per ton, received the same treatment as No. 1, and gave an extraction of from 99 to 100%. Seldom more than 60c. was left in the tailing. When the material was sun-dried, often only a trace was left. Another canvas plant product (No. 3) ran $150 gold, 30 oz. silver per ton, and gave the same results as No. 2 with less cyanide, 1.5% solution and the same quantity of bromine being used. The high-grade concentrate, $2000 gold, 150 oz. silver per ton, was obtained from the side settling boxes on Frue vanners where the very fine sulphides would float and finally settle. These were either treated by themselves or mixed in with the No. 2 product. Zinc shavings was the means of precipitation. The solution, while always strong in cyanide, was built up in alkaline strength with caustic soda, 2 lb. to the ton, before entering zinc boxes. A small steady stream should flow in the boxes. Sudden starting and stopping will cause a loss by loosening the adhering particles and carrying them on down. About 95% of the gold and silver will precipitate in the first three boxes, but from 10 to 18 boxes are used as a precaution against loss. I have never yet allowed more than a trace to be found in 10 assay tons of solution on leaving the zinc boxes. I do not believe that a higher tailing solution value is necessary in any plant. The zinc-box tailing solution may be used again on making up a new charge, bringing its strength up with additional cyanide.

These were the results at one mine, but I have had the same success at others. In one case the concentrate was three or four years old, badly decomposed, and assayed $30 to $40 gold per ton. There was 700 tons piled up—it costing as much as the material was worth to ship to smelter. The mine was 60 miles from the railroad. This concentrate was treated at a cost of $10 per ton, including the tailing loss. There are many other mines in similar situations where concentrate is not worth saving owing to the high cost of shipping. The cost is not all in freight and smelter treatment charge. Sacking, hauling, and the wear on sacks, is quite an item. Taking $100 concentrate as an example—95% of the assay value is paid, $5 being lost to the shipper; $20 per oz. is paid; were it bullion the price would be $20.67; and on 5 oz. the loss is $3.36 more. It is not necessary to review the moisture disputes and dissatisfaction, but summing up the total cost, it will be found that a liberal margin can be allowed for the treatment of concentrate by cyanidation.

MURRAY N. COLMAN.

San Francisco, August 10.

A Cyanide Problem

The Editor:

Sir—I will not pretend to be astonished at the caustic reply of 'Metallurgical Engineer' to my inquiry for information in regard to the treatment of auriferous and argentiferous ores carrying antimony, for I am not. I have had the opportunity to read most of the works on the cyanide process, including those by Scheidell, Bosqui, James, Louis, Park, Clennell, Julian and Smart, and several others, besides numerous classical contributions on the subject from every gold mining field of importance in the world, and must confess that the most diligent search has failed to discover anything of consequence, and I may add, of value, on the question in point. Since this is so, our friend, 'Metallurgical Engineer' is to be congratulated on the possession of the secret—or are all of these excellent and experienced engineers holding this particular card up their several sleeves, with a view to turning it to good commercial advantage? This I do not believe, for almost every phase, it would seem, of the application of the cyanide process in its many modifications to ore treatment has been elaborated and all secrecy banished, in the lengthy, and sometimes acrimonious, discussion of various matters. It would be strange indeed if this one lonesome vexed problem were the only one left undebated. I learned many years ago that an attempt to create a 'corner on knowledge' was almost hopeless, and I think this instance will prove to be no exception.

MINE OWNER.

Tucson, Arizona, August 29.

Special Correspondence

ST. PETERSBURG, RUSSIA

Far Eastern Goldfields — New Fields on the Okhotsk — Geological Surveys — Dredging in Siberia — Exploration of Sakhalin.

The Far Eastern goldfields which according to some reports, are of fabulously high content and according to other again of very low grade are coming gradually into prominence as centres of gold production. There is no need to make reference to the extraordinary operations said to have been conducted by the North Eastern Siberian Co which, under the pretense of being a gold company, it is held is dealing rather in furs and whiskey or again to the alarming rumors on the part of some Russian patriotic enthusiasts who maintain that the Americans and Japanese between them, particularly the former are getting fast hold of the mineral riches in the Okhotsk area, and becoming, as a matter of fact, dictators to the local population, which looks to them rather than to the Russian Government, as an ultimate court of appeal. The fact of the political supremacy of the Russians in the region named makes the reports that appear in the Russian press prob

Sending Gold to Government Assay Office in East Siberia.

ably the most reliable that can be had on the subject of the mineral wealth of the district. The 'Pravitelstvenny Viestnik,' which is a Government organ, has announced that in the course of the present year, 1910, a new auriferous district has been found in the Okhotsk marine area near the well-known port called Anna on the Okhotsk Sea. The district includes parts of the basins of the Aldama, Lantar, and Nemuya rivers. The 'Dalny Okrain,' announces that in this new region one gold contractor has taken up 100 allotments, while altogether 200 will be allocated. The new area extends over 300 versts (200 miles) along the coast of the Okhotsk Sea. It has a breadth of about 40 versts (27 miles), and it first came into notice about fifteen years ago when the Minister of Agriculture and Government Properties suggested to the Committee of the Siberian Railway, the advisability of organizing a detailed investigation of the auriferous deposits of Siberia and particularly of studying the auriferous shores of the Okhotsk Sea, the western shore of Kamchatka, and the Shantar islands. In the year 1895, an expedition was sent out under K. Bogdanovitch, mining engineer. After a preliminary reconnoissance and detailed geological investigation of the area, the presence of gold was established in many of the river valleys between the left bank of the river Uda and the port of Ayan, as also on the upper parts of some of the rivers of the western shore of Kamchatka. These surveys showed the presence of gold chiefly on the Aldama system and its branches. One of the tributaries on the right, about half way along the course of the Aldama—Kaiegakot, in some places showed as much as 10 zolotniks per 100 poods of sand (about $20 per yard). This bed, which was about 1 ft. 9 in. thick, lies about 2 ft. 4 in. under the surface. The climatic conditions of the mountainous district of the shore and of the Okhotsk Sea between Uda and Ayan have certain peculiarities due to the proximity of the sea such as frequent wind storms in the winter, and autumn [illegible] Nikolaevsk to Ayan much snow falls. The period between the thawing and freezing of the rivers is [illegible] between the months of May and October. The average temperature for the period 1896-97 as observed in Ayan was for December —14.5° C, January —26, February —16, March —10. In order to mine on the shores of the Okhotsk Sea provisions, mules and workmen must as a rule be sent there by water. The opening of navigation in the Ayan district may be counted the end of June and at Tchumikan on the mouths of the Nemuya about the middle of July and sometimes even later, as was the case in 1907. The bay of Udska remains closed with floating ice almost until the middle of August. The latest period for the sailing vessels from Ayan is October 23 to 28. Consequently under the most favorable conditions, the season may be calculated to last about 90 days. With the present intimate knowledge of the conditions of navigation in the Okhotsk Sea this period might be increased, but for no more than fifteen days.

The Far Eastern goldfields of Siberia hitherto worked have been entirely alluvial, or practically so. They are, therefore, good grounds for the application of dredges, the chief difficulty being the long winter season. It is interesting to know that experiments have been made in northern latitudes of Siberia in the working of dredges practically throughout the whole winter and with considerable success, the cost not consisting, as it turned out, so much in the wear and tear of the dredge as in the difficulty of maintaining the staff at the requisite level of numbers and good condition in point of health. It must not be forgotten in the studying of this question that in those latitudes perpetually frozen ground has frequently to be dealt with. While this is not peculiar to Siberia, it is a matter of importance none the less.

Not long ago an expedition left St. Petersburg for Sakhalin, organized by the Geological committee, with the express object of investigating the gold deposits which are to be found there, in crystalline schist. This expedition will investigate an area occupying about 9000 square versts. One section of the expedition, under the guidance of the geologist, N. P. Tichanovitch, who is accompanied by two military topographers, will examine the eastern part of the island. The second section, under the guidance of P. I. Polievog, mining engineer, who is also accompanied by two military topographers, will undertake the investigation of the western portion of the island, in that area which touches the rivers Tolma and Parona. Both these engineers last year investigated the island of Sakhalin for naptha and coal; and as a result of their efforts, fifteen occurrences of petroleum and a great many coal deposits were found.

LONDON

Dunderland Iron Ore Co.—United Alkali.—Botallack Pitchblende.—National Minerals Corporation.

The Dunderland Iron Ore Co., operating in Norway, is about to try a new magnetic separator, namely, the Ullrich, made by Krupp of Essen, Germany. These deposits have been developed on a gigantic scale and vast sums have been spent on dry concentrators, all to no avail. The ore consists of low grade hematite and magnetite, and contains phosphorus. In the Ullrich machine the separation is done entirely under water, between electro-magnets below and a revolving disc containing concentric circular poles above. The iron in the stream of pulp is attracted to the revolving poles and as the disc revolves and carries the particles out of the field of the electro-magnets, a downward current of water washes the particles off and delivers them into another receptacle. Henry Louis, consulting engineer to the company, and D. A. Brenner, manager, report hopefully of the machine, but they wish to see the large scale tests carried out before finally forming a judgment.

A few years ago the United Alkali company introduced

a wet method of removing arsenic from sulphuric acid produced from impure iron pyrite. The inspector under the alkali act reports that this or similar processes are now at work at fifteen sulphuric acid works in Great Britain. These processes are important nowadays when so much starch is saccharized by acid; and also they make it possible to produce pure acid from poor quality pyrite. In the United Alkali process, the sulphuric acid is first brought into contact with a reducing agent in order to bring the arsenic to the arsenious state, and then exposed to the action of dry hydrochloric acid gas. The result is that arsenious chloride is formed. This being an oily liquid most of it can be separated by settlement. In order to remove the remainder, air is blown through the acid. The chloride comes away as a vapor, and on being brought into contact with water in a scrubber is decomposed into arsenious acid and hydrochloric acid.

From time to time rumors have been circulated to the effect that pitchblende has been shipped from the Botallack mine, Cornwall. It is therefore interesting to record the official notification that the pitchblende supplied to the Curie laboratory in Paris is the most radio-active of any ever received at that institution. A contract has been arranged for the delivery of all pitchblende found at Botallack within the next three years. No details are given as to the price but the fact that much labor is diverted to the discovery of pitchblende patches in the Wheal Edward part of the property, shows that the business promises to be profitable. The development of the Botallack mine has been hindered recently by the refusal of the miners to work below the 70-fathom level in the new Allen shaft, owing to their remembrance of water remaining at about this level in the Crown part of the mine extending under the sea. To meet the request of the miners, the old shafts in this portion of the mine were reopened and pumps put in to reduce the water-level. This having been done the sinking of Allen's shaft was resumed. In the course of subsequent sinking a promising tin lode was found not far below the old water-level. A cross-cut is to be driven when a depth of 90 fathoms is reached in order to test its continuity. It is interesting to record also that further supplies of power are to be brought from the new electric generating station at Hayle. The inability of the directors to find further capital for the purpose of once more reopening the Hingston mine in East Cornwall is greatly to be regretted. When this mine, together with Gunnislake Clitters and other old properties, was acquired by an Anglo-German group now identified with the National Minerals Corporation ten years ago and modern plant including magnetic separators erected, it was thought that a new era had arrived in Cornwall. The subsequent history is sufficiently well known and need not be repeated now. Mr. Allen, who found capital to restore the mine after the collapse of the company and concurrent flooding, has not been able to persuade anybody to provide the further £25,000 necessary to develop the mine and remove the dressing plant from Clitters to Hingston. The Clitters mine has never been worked below adit, and the orebodies do not give sufficient inducement to follow them down, but at Hingston there are better prospects, and seeing that there is a dressing plant ready provided it is a wonder that somebody does not have the courage to come forward.

I have from time to time referred in a critical spirit to the doings of the group operating the National Minerals Corporation and during recent years controlling various schemes in Cornwall, notably Falmouth Consolidated, St. Ives Consolidated, and St. Agnes Consolidated. These three 'consolidateds' consist of groups of old mines abandoned by the Cornish miners. Whether the shareholders will ever get anything is a remote point; the promoters are doing well enough. The latest news is from the St. Agnes Consolidated. This company has paid to the promoters shares nominally worth £137,466 for a number of abandoned mines, full of water, and of no recorded value. The company also acquires from the National Minerals Corporation the agreement to purchase the West Kitty, an active mine but in desperate straits. The St. Agnes Consolidated has raised only a small amount of working capital so far, quite inadequate to the requirements. The National Minerals Corporation has erected an experimental electric smelter at St. Ives, Cornwall, supplied with current from the generating plant of the St. Ives Consolidated. Some six months ago the Corporation announced that a patented process had been acquired, and that by its means the total content of the ore could be recovered. In recent years several metallurgists have tried to apply electric smelting to complex Cornish ores. One of the most interesting was the experiment on tin slag, of which there are enormous heaps at all the five smelters. This slag contains most of the wolfram and iron, and a small proportion of the tin, contained in the concentrate commonly called 'black tin.' Some electrometallurgists thought that electric heat without addition of carbon would effect a concentration by melting, but the valuable constituents of the slag are so near the same specific gravity that such a proposition was futile. By the addition of carbon a reduction takes place in the electric furnace and a semi-alloy containing the metals is obtained. The subsequent separation of the metals depends on the recovery of wolfram as tungstic acid. All these processes are, however, complicated. The cost of current is an important item, and the wolfram product is not the most profitable. The prospects of working such a process at St. Ives are of greater promise from the scientific than from the economic point of view.

COEUR D'ALENE, IDAHO

Caledonia Mine.—Nabob Mining Company.

The Caledonia mine is situated near the head of Deadwood gulch which opens into the Coeur d'Alene just below Kellogg. The mine is in the neighborhood of the Bunker Hill & Sullivan, and one of the Federal groups. It is opened by a 42° incline, which was driven 500 ft. in the quartzite foot-wall of the vein, the inclination corresponding to the general dip of the vein. This shaft has two compartments, one for a ladder-way and the other for a 2-ton skip. An ore-loading pocket has been put in just below the 300-ft. station from which about 700 ft. of driving has been completed on the vein showing a width of 7 to 20 ft. A force of miners are working in three stopes above this level, which have been carried up from 25 to 60 ft. The ore found on the 300-ft. level and in the stopes above it contains lead carbonate and silver, the latter occurring as chloride, native, and in tetrahedrite. The next hoisting level is at 500-ft. depth, at the foot of the incline. The driving on the vein from this station amounts to 500 ft., and several stopes are being carried above it. Three intermediate levels between the 300 and 500 serve as the basis for stoping operations. These intermediates connect with ore-chutes leading from the highest one to the 500-ft. level. The ore found on the 500 and the lower intermediate levels here changes to galena, sulphide of silver, and tetrahedrite. Hand-drilling is the method by which a good deal of the ore is broken, though there are air-drills in the mine. In the course of the work a great deal of fine ore results and a lot of this is sacked and some of it is hand-jigged at the surface. It is announced by Charles McKinnis, the manager, that a concentrating mill will be built next year. In the meantime a cross-cut adit is being driven from Deadwood gulch to tap the ore several hundred feet below present workings. It is probable that the mill-site will be at the mouth of this. A Gould electric pump, set below the 500-ft. station, is able to keep the lower workings free from water. E. D. Booth who has charge of the mine work, states that they are hoisting about 45 tons of ore per day.

The Nabob Mining Co. has a property on Pine creek, 2½ miles southwest of the Bunker Hill & Sullivan group, which has been developed by about 2000 ft. of work. Recently a 40-hp. gasoline engine and air-compressor were installed at the mouth of a 336-ft. adit. The plan is to drive 1200 ft. farther on this adit to cut 145 ft. below the bottom of a 365-ft. shaft, and then make a raise to the shaft. Two cars of ore shipped sampled 55% lead, with a good deal of silver. The vein is said to have a width of 18 in. to 5 ft.,

and a considerable tonnage of ore is already developed. Harvey M. Rice of Kellogg is manager.

SALT LAKE, UTAH

Tooele Smelter —Utah Copper Curtailment —Daly West Report —Beck Tunnel Uncle Sam Suit

The most interesting items in this district are the commencement of operations at the new Tooele smelter and the steps which are being taken toward a temporary curtailment of the copper output. At the smelter ore was started through the sampling mill on August 4 and the first furnace was skimmed on August 15. The plant was in operation within the time allowed thirteen months from the completion of the railroad and was constructed within the appropriation set aside for it. Operations so far have not been attended by the trouble which almost invariably attends the starting of a new plant of any kind but, on the other hand, have gone along with remarkable smoothness. Two of the furnaces are being fed with Utah Consolidated ore and a third is almost ready for warming up. The first copper will be cast into souvenirs and distributed by the management.

Aside from closing the Copperton mill the Utah Copper Co. is curtailing production at the other mills. During the first half of August the average daily tonnage was only 13,104, whereas it has been in the neighborhood of

Open-Cut Mining at Bingham Canyon.

16,000 previously. This would indicate a decrease in production of about 20%. No reduction has been made in the force of men employed as the company will devote the time of curtailed production to development. August 16 a cave occurred in the old Boston Consolidated workings, 252 ft. of drifts in the porphyry being destroyed. Fortunately the accident occurred during the noon hour and what might have been a terrible tragedy was averted. Some days will be required to repair the damage done. The second quarterly report of the Utah Copper Co. states that all underground work will be discontinued at an early date. During the quarter surface stripping on the Boston Consolidated portion of the property was resumed and additional equipment was put to work on original Utah Copper ground.

The second quarterly report of the Daly West which was not sent out at the time of the checks for the dividend has been issued. It shows a net profit of $12,500 over all expenses including dividends of $54,000, but adds that developments for the quarter were disappointing both in the amount and grade of ore opened. The report announces that operations will be suspended in part until the lower levels of the mine can be proved and if conditions are found to be satisfactory a new mill will doubtless be constructed at the mouth of Ontario tunnel No. 2. In view of this report it will not be surprising if production be entirely stopped within a short time. At the Daly-Judge the entire equipment except the hoist has been electrified with power from the Snake Creek Power Co. The new Starrett pump has removed the water to the 1600-ft. level which opens the way for exploration of some rich ore which was supposed to exist at this level but which has not been proved. On this a flood of water drove the men out without even time to secure their tools.

Suit has been filed by the Beck Tunnel company against the Uncle Sam for $100,000, three times the value of ore it is said to have been illegally extracted by the defendant from plaintiff's ground. A temporary injunction has been granted. There is a theory held by some that the Uncle Sam apexes on the Beck Tunnel ground and, if this is the case, the suit may develop into one of extralateral rights. It is to be hoped that the action will not be a repetition of some of the bitter litigation which has proved so ruinous to some of the Little Cottonwood mines, notably the case of Eureka Hill v. Bullion Beck and Grand v. Mammoth.

In American Fork the old Silver Bell has been reorganized as the Eudora Bell and preparations are being made for active operation. The Salt Lake Copper Co. has received a new cable for its tramway and, as soon as the repairs are made, will commence shipping iron ore at the rate of about 200 tons per day to the Garfield smelter. An interesting point is about to be decided in mining law by the authorities at Washington, namely, whether work done by diamond or churn drill can properly be applied toward the granting of a patent. In the case in question the application has passed the local authorities and the decision from Washington is being awaited with interest although there seems to be no reason why it should be adverse.

BUTTE, MONTANA

Smoke Cases Reopened. — Disposal of Tailing. — Butte Mines.

The so-called smoke case is apparently to be renewed with more vigor than ever this fall. Some months ago the Attorney General of the United States, acting on representation made to him by the farmers of the Deer Lodge valley, filed a suit against the Washoe Copper Co. alleging that vegetation was being destroyed by the fumes from the Washoe smelter at Anaconda. It is the same old case which was heard before Judge Hunt, but the findings in the case were not considered satisfactory, so the Government was induced to take up the matter. A dozen or more expert chemists are now in the Deer Lodge valley taking samples of the soil and examining the trees, vegetables, and grain for the purpose of ascertaining if the allegations of the farmers are correct. The Anaconda Copper Mining Co. which owns the Washoe smelter, has a number of experts on the scene also making tests and taking of testimony is expected to be even more extended than it was in the smoke case of more than one year ago. Considering the dryness of the season, the crops in the Deer Lodge valley never looked better which shows that the alleged poisonous gases and arsenic from the stack of the smelter are not as destructive to the grain and vegetation generally as represented by the ranchers. Whether the Attorney General, Mr Wickersham, will personally appear in the case is not known, but it is believed he will in view of the fact that he is named in the complaint as the Government's attorney. The side of the Anaconda company will be represented by C. F. Kelley, chief counsel for the Amalgamated Copper Co., and several assistants.

The ranchers in the Jefferson valley are strongly protesting against the dumping of tailing from the Basin concentrator in the Jefferson river, and there is talk of action being brought to restrain the management of the Basin mill from what is alleged as polluting the water and making it unfit for domestic purposes. Should such action be taken it will seriously interfere with the working of the Butte & Superior mine and also the Davis Daly, as the ores from both mines are treated here. The recent decision of Federal Judge Dietrich of the Idaho district in practically deciding that the ranchers had no ground for complaint up to the present time as to the dumping of tailing in streams, but at the same time awarding the mine plaintiffs a verdict for $1 in all, will have an important bearing in the case of the Jefferson valley ranchers inasmuch as the cases are practically the same so far as the alleged pol-

lution of waters are concerned. It is said that the Jefferson valley ranchers have held consultations on the matter, and that one or more lawyers have been consulted with a view to seeking a remedy. As yet, however, no formal steps have been taken to bring the case before the courts but it is believed that in the immediate future a start will be made. Whether an attempt will be made to close down the concentrator or an agreement will be entered into to prevent such step is not known at the present time. The announcement is made that F. Agustus Heinze is coming to this city to look after the Davis Daly property and put the Colorado mine in shape for the commencement of shipments of ore to the Basin mill. It is stated that something like 39,415 shares defaulted on the first payment of the $1 assessment, but this was rather expected and it is now assured that after the second payment of 50c. is made September 20, some $561,594 will have been received into the treasury out of $600,000, which would have been realized if all the stockholders had paid the assessment. It is stated that within the next 30 days the Colorado ore will be going to the Basin concentrator at the rate of about 200 tons per day, but up to the present time no orders have been received in this city to prepare for active operations. A large amount of concentrating ore has been blocked out on the levels down to the 1700, sufficient, it is stated, to keep up shipments for a year or more.

Development is going along in the various mines of the Anaconda company without interruption. The new shaft in the Gagnon is down about 800 ft., while the sinking of the new Belmont shaft to connect with the Anaconda mine is down 1600 ft. The boom in North Butte the past week has been due to the highly encouraging reports coming from the mine. During July the company produced nearly 2,000,000 lb. of copper. It is reported, on what seems to be good authority, that ore of a high grade has been found which will bring the mine back to its old standing among the rich producers of the district. The Hudson mine in the Twin Bridges district which in the past has produced much valuable ore, has passed into the hands of New York capitalists who refuse to disclose their identity at the present time. An old mill known as the Iron Rod, on the west bank of the Jefferson river, is being remodeled and equipped with modern machinery and will handle the ore of the Hudson. The mill has not been operated for twenty years and the machinery is so crude that practically every part of it will have to be replaced.

BLACK HILLS, SOUTH DAKOTA

Non-Metallic Products.—Lithium Mining.—Dredge Operations.—Homestake.—U. S. Assay Office.

In the southern Black Hills, the neighborhood of Keystone, Custer, and Hill City, considerable activity is noticeable in the mining of non-metallic mineral products. Lithium minerals, mica, and wolframite are commanding the attention of many of the residents of that district. The mica industry is the principal feature at Custer. The Westinghouse company owns a number of properties and is deriving its entire mica supply from them. This company has mined mica at Custer for about four years, and is gradually adding to its holdings and bettering the equipment of them. Its deepest shaft is at the New York mine, five miles southwest of Custer. Within the past week the mica has been opened on the 300-ft. level, making this the deepest mica mine in the world. The quality is better than above, the mica being less brittle—probably due to the fact that this point is below the oxidizing effect of atmosphere and surface water. The New York mine is equipped with 500-hp. boilers, a steam-hoist, 150-kw. generator, electric driven air-compressor, and pumps; 70 to 80 men being employed in the production of 4000 lb. per week of sheet mica and a large tonnage of scrap. At two others of its properties the Westinghouse company has steam hoisting and compressing plants. At one the shaft is being rapidly sunk to the 200-ft. level, and at the other mining is being carried on at the 100. This latter mine is making a good production, but further development will be instituted as soon as the New York is opened on the 300. At to other properties the company is carrying on small development by hand methods.

Keystone is the centre of the mining of lithium minerals, the Etta mine and the Reinbold properties being the important producers. Amblygonite, a fluo-phosphate of lithium, containing 11% lithium and 48% phosphoric acid, is shipped regularly. The output of the Reinbold mine goes to the plant at Omaha, owned by Hermann Reinbold, while the material from the Etta mine, which is operated by Denis Henoult, is shipped to the chemical works on the Atlantic coast and to Germany. Along Rapid and Castle creeks, in the central Hills, placer mining has been conducted more vigorously than for many seasons past. The creek beds and bars have long been known to be valuable, but the water problem has been difficult of solution. The large bedrock flow has stopped many enterprising operators, and it is only within the past year or so that dredges have been suggested as a possible remedy. This season work is under way on the installation of a big dredge at a point a short distance above Mystic, on Castle creek, with the expectation that it will be in operation this fall. The results will be closely watched, many of the operators contending that the bedrock is too rough and hard to permit satisfactory dredging. Hydraulicking and sluicing are being carried on at a number of points, the biggest plant being at Pactola, on Rapid creek.

The Homestake employees' aid fund became operative August 1, business being started by a deposit of $1000, the gift of the Hearst Mercantile Co., operator of the biggest store in Lead. The fund will be maintained by assessing each employee one dollar per month, which will be deducted from his wages. In addition to this the Homestake company agrees to contribute $1000 per month. The rules under which the fund will be disbursed call for a payment on account of disability through accident or sickness, one dollar per day, the sick benefit commencing after the sixth day. Payment of this amount will be made for six months, with a privilege given the board of directors to continue payments beyond that limit. For the loss of both hands, both feet, both eyes, fracture or dislocation of the spine, causing total disability, the fund will pay $800. For the loss of one hand, one foot, or one eye, $400. The death benefit is $800, payable for death from accident received while at labor for the company, or from sickness. Very stringent rules are laid down for the purpose of suppressing drunkenness and immorality. No benefits will be paid for accidents due directly or indirectly to intoxication, the idea being to thus protect the fellow worker of the intoxicated man from danger or accidents that might be caused by the carelessness of the man who has been dissipating. The board of directors consists of five members, elected for one year. For the present year they are: J. W. Freeman, chairman, chief physician and surgeon; Richard Blackstone, assistant superintendent of the company; W. S. O'Brien, mine foreman; A. J. Clark, superintendent of cyanide mills; and J. A. Spargo, master mechanic. T. J. Grier, superintendent of the Homestake, is treasurer of the fund. The Homestake company furnishes, without charge, such office room, stationery, and clerical help as is necessary.

The United States assay office at Deadwood now handles the entire output of the Black Hills mills. Commencing August 11 the Homestake company turns over its entire output to this office. This means a material increase in the business of the office, placing it, in value of bullion handled, far ahead of all Western offices but Seattle. The Homestake company had always insisted that payment for its bullion be made in New York funds, and until recently the Deadwood office was not in shape to meet this requirement. During the spring E. W. Martin, Congressman from Deadwood, was instrumental in securing the opening of an account with the assistant treasurer of the United States at New York, and upon the Homestake being notified that payment could be made by check against this account, arrangements were made for shipping the entire product of the company to the Deadwood office.

LOS ANGELES, CALIFORNIA

The Oil Industry —Clara Consolidated —Activity in Iron

The Western Oil Producers Association was organized here on the evening of August 25. Over 100 oil operators were present at the meeting but the expected delegation from San Francisco did not appear. Chiefly on this account an attempt was made to postpone action. This was partly successful in that the association did not commit itself to any policy. After effecting an organization and adopting the by-laws, following much spirited debate, it was decided to call another meeting for next week, thus giving the northern men time to be heard. Only 51 names were placed on the membership roll but it is hoped that many others may sign before the next meeting. Permanent officers were not elected. An attempt to merge the next meeting with the one called at Bakersfield for September 1 was defeated. The by-laws as adopted provide that it shall be the purpose of the association to unite the oil operators of California and the West for the protection and advancement of the oil industry; to secure legislation that will govern the disposition of public lands containing oil in a manner just and equitable alike to the operator and the Government; and to devise ways and means for effectually advancing the common interests of oil men by all legitimate methods. Contrary to views expressed at the first meeting, there was demonstrated at this a decided opposition to any form of conservation of oil lands and to the disposal of them by any method other than location and discovery as at present. It is probable that the resolution to be presented at the meeting of the American Mining Congress will embrace a plan for the betterment of conditions in which conservation will not be mentioned.

The American Petroleum Co., operating chiefly in the Coalinga field, has at present 35 producing wells, yielding a total of 11,000 bbl. per day. Fourteen additional are being drilled. The average depth of all wells is 2000 ft. The payroll amounts to about $25,000 per month. The American Oilfields Co. has six producing wells in the Midway field, producing 25,000 bbl. per day. Eighteen new wells are being drilled. Well No. 79 is now flowing at the rate of 20,000 bbl. per day. No. 68 is doing about 4000 bbl. The payroll amounts to $25,000 per month. The Lakeview gusher of the Union Oil Co. in the Maricopa Sunset field is now flowing at the rate of 20,000 bbl. per day. This company has 29 other operating wells in this district flowing a total of 10,000 bbl. The next largest production of this company is from the Santa Maria field, where 90 wells are yielding 12,000 bbl. per day. The smallest production is from the Ventura field where 115 wells are yielding only 500 bbl. per day. The Union company has just abandoned its Brashear No. 1 well, situated five miles west of Los Angeles. This well is the deepest in California, having been drilled to a depth of 5665 ft. The outfit has been moved to the Fullerton field, where a well about 4500 ft. deep will be drilled on the Baster-Chury lease.

At the property of the Clara Consolidated Gold & Copper Mining Co., Swansea, Arizona, the installation of the large steam-hoist over shaft No. 5 has been completed. This shaft is now 200 ft. deep and sinking is being rushed. It is figured that 60 ft. more will put the shaft in the orebody demonstrated by the drill holes. All the surface construction work has been completed and the construction crews laid off. The mine and smelter are assuming rapidly a normal operating basis. The Federal Development Co. and the Noble Electric Steel Co. are active in the Minaret district, Madera county, California. Both companies have spent quite a large amount of money in exploratory work and there is every indication that they will be working on a large scale before many months. It is reported also that the Guggenheims and Charles M. Schwab have been quietly securing options and making investigations in several localities. The activity of the Noble company is traceable to the recent successful run of the Heroult electrical smelting furnace where contracts have been let to furnish equipment for four more units.

JARBIDGE, NEVADA

Lack of Capital — New Discoveries. — True Fissure Group — Shadow — Map of Claims

This camp continues to show a steady advancement regardless of the fact that there is practically no money coming in to it for development. The payroll is abnormally small considering the size of the camp but the lessees and prospectors are doing their best to prospect the ground. They are opening new veins and obtaining good assays in many places and when the money does come into the camp there will be an abundance of good prospects ready for development. The latest discovery was made two days ago about eight miles southeast of town on what is called the fifth crater near the head of the river when Hays & Frankhi opened a vein five feet wide with a streak of high grade quartz on the hanging wall. This is apparently the same vein that has been opened in the third and fourth craters, and in the third crater on the Third Peak No. 1, belonging to the Twin Fissure Gold Mining Co. This vein has been

Rim Rock near Jarbidge.

opened in several places for the entire length of the claim, showing a large body of quartz from which some good assays have been obtained. Near the north end of this claim, R. F. Harder and Bishop Norman have opened a spur vein five feet wide from which ore assaying $240 per ton has been taken. Three assays were obtained on ore from the Arkansas claim which has been bonded to a representative of Eastern capital. The vein has been traced southwest into Snowslide gulch, crossing the DeWitt and La Veda claims, and through the Little Mud, on which it is 10 to 15 ft. wide. The latter group has been bonded by Colorado men. An adjoining property known as the Shadow has also been bonded by Denver interests. The Shadow vein has been traced north through the Red Rooster claim in Gorge gulch and is supposed to be the same vein on which the Winkler discovery was made. The latter ground, on which the finest showing in the camp has been made, is still tied up in the courts by the several conflicting interests.

The Rock Creek and It claims north of the Bluster have been bonded and considerable trenching has been done to find the vein in place, but so far only rich float has been found. The Success group adjoining the It, Bluster, and Shovel claims has been bonded to Colorado interests. This property is known to be crossed by several veins, the Pick & Shovel and others. A new vein has recently been opened

near the Bluster on the south and the Success claim which is five to six feet wide. The 4 M lessees have a carload of ore ready for shipment and are finishing a road from their camp to town in order to ship at an early date. This ore is expected to yield high results.

W. W. Williams, who has a bond on the Red Bird and Buffy claims just east of the Pavlak has a force of men at work prospecting and has opened two veins which pan well. Theodore Parks has nad his Jarbidge Wonder No. 1 and No. 2 and the Minnie claims near Snowslide gulch surveyed and is prospecting preparatory to developing the ground. The surface shows considerable good float and he has found two veins in place. W. W. Fisk has completed a claim map of the camp, showing the location of over 500 of the more important claims. The Jarbidge Commercial Club has been organized to promote the interest of the camp.

NEW YORK

Dull Market Conditions. — Anaconda Sues Butte-Ballaklava. — Onio Copper Financed. — El Rayo-Dolores Consolidation.

If one were to be guided by the dominant note in all financial comment of the day, emanating throughout the East, he would almost come to think the Eastern slope of the Appalachian range a productive region. Never a prodigal son of modern days has been more soundly lectured on the manifold sins of extravagance than has been our great producing West scolded by the makers and venders of securities. However, the producer is learning some lessons in independence which he will be slow to forget and Wall Street is to learn a primary chapter in corporate honesty, and is to come to a realization that high finance and crookedness are synonymous terms now in the minds of the real people, who are taking the real dollars out of the mines, the corn fields, and the wheat fields of the country, none of which are on the Atlantic seaboard. The lesson for the East is to be a bitter one, the opponents of concentrated financial power are playing the highest trump card they hold, that of letting the securities market alone. In due course our leaders of corporate enterprises will learn that the one real way to win the confidence of the general public is to deserve it. Awe is not so popular as it once was, the iconoclast rather has the public sympathy with him. The markets are deadly dull, it is the vacation season, and many vacations have been lengthened because of lack of business. Barring such slowing down of operations as has taken place at various copper properties where production is curtailed, nearly every mining centre reports great activity. The Esperanza, Ltd., at El Oro, reports the hoisting of more ore than ever before. Cobalt is again making a record output. Porcupine is making good according to local authority. The Nevada camps—Goldfield, Tonopah, and Fairview—are witnessing much new work, but markets lag. The figures recently compiled by the British Government, enumerating the miners throughout the world, give some idea of the great strides the mining industry has made in the past twenty years. In round numbers there are six million miners in the world; all of the varied manufacturing industries of the United States employ in the aggregate only about the same number; in 1894 the number engaged in mining was calculated at 3,130,000. In this country the ratio of increase has been greatest; in 1892 our annual mineral production was $648,000,000, in 1909 it was $1,900,000,000, or almost treble.

A story given out as authentic, to the effect that the Phelps-Dodge interests had purchased control of the Imperial Copper Co. from the Development Company of America lacks confirmation here. On the other hand, it is stated that the Development Company of America recently bought the McCabe mine in Yavapai county, Arizona, from the Ideal Mining Co. The McCabe property was the medium of a most spectacular promotion during the time the property was in the hands of the Model Gold Co. Monthly dividends were paid, bullion bars were placed on exhibit, which were said to show careless melting and upon close examination to reveal the milled edges and mottoes of minted coin. Shares reached a high mark of $15 per share, which was a valuation of $45,000,000 for the property. Federal authorities pricked the bubble by arresting the promoters for fraudulent use of the mails.

The bringing of an action by the Anaconda against the Butte-Ballaklava, similar to the action brought against Tuolumne, is bringing down condemnation upon the Anaconda officials, who are now accused of making unfair use of the courts to sustain alleged apex rights, even as Heinze did against the Amalgamated, in the days when Montana was divided into 'kerosene or pickles.' The suit against Butte-Ballaklava claims some $1,100,000 for ore wrongfully extracted and asks for an injunction restraining further operations. The injunction will be heard early in September. Mr. Heinze has just returned to New York from a stay on the continent, during which he says he financed Ohio Copper, by the sale of $1,000,000 of Ohio bonds, thus avoiding the necessity of selling the timber lands of the United Copper Co. in British Columbia; this step was considered as a possible alternative.

Dispatches state that street laborers have opened a 10-ft. vein of exceedingly rich copper ore almost in the centre of Reno. The find was made at a depth of 10 ft. below the surface and is said to be apparently an apex of a permanent formation. The Calaveras Copper Co., of Copperopolis, controlled by Boston interests, has voted to reduce the capital stock from $5,000,000 to $2,500,000 by reducing the number of shares from 1,000,000 to 500,000. The merger of the El Rayo Mines Co. and the Dolores Mines Co. with the Mines Company of America will be completed about the middle of September. The par value of Mines Company of America is to be increased from $1 per share to $10 per share and Dolores will then be exchanged share for share, or on a basis of one share of Dolores for ten shares of the old stock of the Mines Company of America. El Rayo will be exchanged on a basis of ten shares of El Rayo for seven shares of the new stock of the Mines Company of America, equivalent to one share of El Rayo for seven shares of old stock of the Mines Company. Mines Company of America and Dolores are controlled by a prominent group of capitalists of New York and Chicago, including John J. Mitchell, of the Illinois Trust & Savings Bank of Chicago; Isaac L. Ellwood, of De Kalb, Illinois; John Lambert, of the Illinois Steel Co.; and Harry S. Black, of New York, who is connected with the Fuller Construction Co. and the United States Realty & Improvement Co. Mines Company of America is to be listed on the New York Stock Exchange as soon as the consolidation is completed.

The New York, Honduras & Rosario Mining Co. is to pay dividends quarterly hereafter instead of monthly as has been the custom in the past. The company has distributed 1% monthly for some time. Its properties are at San Juancito, Honduras. The Palmilla Milling Co., a subsidiary of the Alvarado Consolidated which is working the Palmilla mine near Parral, Chihuahua, made famous by Pedro Alvarado, held its annual meeting the last of August. The Palmilla mine was one of the most talked of pieces of mining property on the American continent, while it was worked by the former owner, at one time a peon, and of whom many extravagant tales were told. Since it was taken over by Boston interests, the new promotion, based on the property, has seemed to have an uphill time.

The first annual report of the Sierra Consolidated Mines Co. has just been sent out. This company, which is controlled by the Cole-Ryan interests, took over the greater part of the properties controlled by W. C. Greene and his Greene Gold Silver Co., before the downfall of Mr. Greene and the collapse of the latter company. One of the most valuable concessions taken over was a very large tract of timber land, from which the company is securing all of its mine timbers and lumber for building purposes. A 300-hp. electric generating plant is being installed about six miles from Ocampo, in the heart of the Duranzo timber tract. The company now owns a mill at El Salto which can be run during the rainy season by water-power; later a new mill with a considerably increased capacity is to be erected on the same site.

General Mining News

ALASKA

On August 24 the Alaska Mexican Gold Mining Co. paid a dividend of 2½ per share; the Alaska Treadwell Gold Mining Co one of 1½ and the Alaska Treadwell Gold Mining Co $1 per share.

ARIZONA

COCHISE COUNTY

The third shaft has been started in the Leadville shaft of the California & Paradise company at Paradise. On the Duncan group drifts have been started along the hanging wall on ore that assays 24 oz. silver with $3 to $8 gold per ton. The drift on the Taylor property is in 70 ft. on the vein which contains a fair percentage of copper.

GILA COUNTY

(Special Correspondence.)—Work at the Miami mine underground is entirely as yet for development and is being concentrated on preparing the necessary drifts for haulage purposes.—Development at the Inspiration camp is continuing with the same rapidity that has characterized operations there in the past. The Colorado shaft is at a depth of 350 ft. and will be continued for another 100 ft. or so to bring it to the same elevation as the main extraction adit. The testing plant which is being built a few hundred feet south of the Joe Bush shaft is well under way, some of the tables being already in place and the larger parts of the crushing machinery ready to set up.—A new field of operations has been opened at the Warrior camp as a result of the discovery of a new block of high grade ore in the eastern workings of the mine.

MOHAVE COUNTY

Lewis Rothe and John Oleson who are operating a group of claims in the Secret Pass district have opened a number of rich stringers in the big vein that crosses the property.——The shaft at the London mine is to be sunk an additional 100 ft. and the vein prospected from that level.—The water at the Tennessee mine is under control and work has been started retimbering the old shaft.

PINAL COUNTY

(Special Correspondence.).—The work of channel diversion for the protection of the stock pile and the railroad yards at the Ray Consolidated mine at Ray is progressing satisfactorily. The stock pile protection is complete and work on the yards is well along. The company is gradually putting into operation a scheme for the comfortable housing of its employees. The arrangement whereby the Mexicans have quarters to themselves is working well, and it is planned eventually to have separate quarters for the Americans, Mexicans, Indians, and others. The surface buildings which include dormatories and a guest house, are nearing completion. The present payroll shows 30% white and 70% Mexican, Spanish, and Indian labor in and about the mine. At Ray there are between 700 and 750 men engaged in underground and surface work connected with mining. The average advance made in driving is a little more than 3 ft. per machine per shift, and about 1000 tons of ore per day is being placed on the stock pile. Ore that has been coming from the mine has been crushed in a temporary plant; however, one of the large Gates crushers has just arrived on the ground and this will be moved to the shaft and installed at once. In order to facilitate the development of the mine and provide for a larger tonnage than was at first figured on, a new shaft has been started above the town of Ray. It was first planned to install a mill of about 5000 tons per day capacity, and the mine development was planned accordingly. However, the mill as now going in, will be able to handle from 8000 to 10,000 tons per day.

Ray, August 27.

YAVAPAI COUNTY

(Special Correspondence.).—The Arizona Copper Belt Mining Co., operating sixteen miles east of Wickenburg, [illegible] a car shipment to the Humboldt [illegible] Ore has been found from the 400 ft. level to the surface and has averaged from $[illegible] to $[illegible] per ton in gold, silver and copper. No attempt has been made to sloop out from the shoot which is 50 to 60 ft. and 6 to 7 ft. wide. Work at present is confined to the 400 ft. level. A shaft will soon be started and later a 50-ton concentrating mill will be erected. By fall enough ore will be blocked out to keep the mill busy for some time. F. A. Campion, is in charge.—The Arizona Power Co. is making preparations to construct a long line for electrical transmission into Prescott through Jerome, reaching that point by building from Fossil creek up the Verde River valley. The line will make it practically impossible for the Prescott district to be left without power or light as has happened occasionally in the past.—The new electrical equipment of the Haynes Copper Co., at Jerome, has arrived, and is being installed as rapidly as possible. Development will be resumed as soon as the big pump is in shape to handle the water.—The stockholders of the Ideal Mining & Development Co. of McCabe have ratified the sale of the Ideal and Gladstone mines to F. M. Murphy of Prescott. John L. Davis remains in charge of the properties.

Prescott, August 29.

On a test run of 1000 lb. at the experimental mill of the Big Butte Mining Co., on the Hassayampa river below Walnut Grove, a concentrate assaying 36 oz. gold per ton was obtained. Forest McKinley is manager.

CALIFORNIA

MARIPOSA COUNTY

The American Eagles mine near Exchequer has been purchased by J. E. Meyer & Co., of Los Angeles, and the 150 ft. adit will be driven to tap the vein which is 50 ft. wide on the surface. The ore is free milling and the new owners propose to erect an electrically equipped mill.

NEVADA COUNTY

The Red Ledge Gold Mining Co., has been incorporated to operate the Red Ledge mine in the Washington district.—The owners of the Oustomah mine, near Nevada City, who have been operating the mine since the recent bond on the property expired, have opened a shoot of free-milling ore on the 900-ft. level.—The construction of the Fairview mill is nearly complete and the management expects to have the stamps dropping by the middle of the month. While the work on the mill has been under way over 400 ft. of drifts have been driven on the shoot and several raises run blocking out a large amount of ore.——The St. Gothard Gold Mining Co. which operates the Delhi mine, at Columbia Hill, is to sink the shaft an additional 200 ft. the bottom now being 400 ft. below the adit level. While this work is in progress the 20-stamp mill will be idle.—The old Davis adit on the Pickle ranch is being cleaned out and retimbered, and will be driven to tap the Blue Lead channel.

SHASTA COUNTY

(Special Correspondence.).—The Great Western Gold Co., which owns the Afterthought mine at Ingot, has 15 men at work at the property and is expected to increase this force considerably within the next two months. A new shoot about six feet wide has been opened recently.——The Western Exploration Co. has assumed control of the Milkmaid mine at French Gulch and will commence development in the lower levels.

Redding, August 29.

SIERRA COUNTY

(Special Correspondence.).—During the month of August a number of properties have been opened around Sierra City. The Primrose mine in Wild Hog canyon, seven miles northwest of this city, has been reopened by DuRay Smith, of San Francisco, and a large force of men is at work clearing out the mine and getting the 10-stamp mill in shape to start. This mine was located in 1853.——The Empire Gold Valley eleven miles north of Sierra City has been reopened. The shaft is being repaired and ore is being blocked out preparatory to starting the 20-stamp mill on

the property. Curtis Locklin is superintendent.——The Cogley brothers have been reopening the St. Louis mine, three miles from Sierra City, and have a large body of ore blocked out.——The Cleveland mine, which has just finished one mill-run, has a crew of men breaking ore for another.——The Standard mine is crushing ore in the custom mill at Downieville. The ore is rich arsenical pyrite and is from the same vein that $17,000 was taken from a few weeks ago.——The Chipps will have the new 10-stamp mill started early in September and a force of men is now busy getting out ore for the initial run.——The Sierra Buttes mine is looking better than it has for years. All work is being done through No. 6 and No. 7 adits. At the mill the ore-bins are being repaired preparatory to continuous operation.——C. R. Thompson and associates have taken a bond on all the holdings of the Lee brothers, at the head of Black's canyon. A shaft is to be sunk on the vein for 200 ft. and drifts run to develop the property. Three shifts are working.——At the Colombo the new lower adit has been started and will be driven 1000 ft. to cut the Colombo vein.——There has been a small stampede to the old camp of Meadow Lake twenty miles east of Sierra City. There are about 100 men in the camp, the ores of which are rebellious and must be shipped to smelter. Clutt & Ramsey are making up a shipment of rich galena ore containing gold, silver, and copper. Campean is shipping the same class of ore to smelters and Cook & Clark have rich copper ore in the shaft on their property. The vein is 10 ft. wide. The Porter brothers, of Denver, are erecting a cyanide plant on the old Hartley property.

Sierra City, August 27.

TUOLUMNE COUNTY

(Special Correspondence).—The mining of gold-bearing gravel has begun at the property of the Gold Ship Mining Co., near Groveland. Sluices are to be laid at once and grading for the mill will be commenced as soon as the work of putting up an electric power line is well under way. It is the company's intention to install more machinery in the near future.——Development is being carried on with renewed energy at the Mohican mine and it is reported that an important discovery has recently been made. The overhauling of the mill has been completed, new mortar blocks put in, and a new ore-bin erected.——Dredging operations were started this week at the gravel property of the Tuolumne Consolidated Co., near Phoenix lake. It is expected that approximately 2000 cu. yd. per day will be handled.——The operators of the Dutch & Sweeney mines expect the arrival soon of 6250 ft. of 6-in. pipe, which will be used to convey water from the ditch on the Harvard hill to the concrete reservoir on the Dutch claim. It is expected that complete operations will be resumed within a few weeks. The drift on the 400-ft. level of the Dutch is 500 ft. long and will be driven to connect with the Sweeney shaft where a rich orebody was penetrated.——At the Tarantula mine, of which T. C. Crawford, of London, is the principal owner, a crew of men is grading for a 20-stamp mill, the machinery for which is due to arrive soon. It is the intention to eventually increase the crushing plant to 100 stamps. Approximately five miles of adits, drifts, and cross-cuts have been driven and development is still going on uninterruptedly.

Tuolumne, August 29.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence).—A body of mixed ore and quartz 2 ft. wide has been uncovered in the breast of the adit being driven on the Big Indian vein. Samples assay 2.5 and 4.4 oz. gold per ton.——J. G. Hite has erected a small plant below the Capital mill and the tailing is being treated. About 10 tons per day is being handled.——A. H. Colburn has taken a bond and lease upon the Annex and Pinion claims on Alpine mountain, the bond calling for $15,000. The Annex is an extension to the Sporting Times which has been extensively developed.——Stephens brothers shipped a carload of lead from the Mendota mill last week that brought a settlement of 60% lead and 68 oz. silver per ton.——A 50 and 25-hp. motor arrived last week for the Lombard mine. It has been decided to double the capacity of the 25-ton mill, while machine-drills will be brought into use in driving level No. 4. K. Seemann is manager.

Georgetown, August 27.

GILPIN COUNTY

(Special Correspondence).—Work on the Frontenac mill is being hurried, a force of 20 men being employed. It is hoped to have this plant in operation within 60 days.——The New York mill resumed operations last week after a shut-down of four weeks due to the dam being washed away. A large amount of ore has accumulated and it will be necessary to keep the machinery in operation night and day for some time.——The road leading to the National mine has been repaired and the new machinery is now being delivered. McKay & Co. are operating under lease.——A small mill is in course of construction below the dumps of the Buell mine. The equipment will consist of crusher, four bumping tables, rolls, and three Wilfley tables. Ore is to be treated that is worth $2.50 to $3.50 per ton. Smith & Sydow are the operators.

Gregory-Buell Mine.

Central City, August 26.

TELLER COUNTY

M. B. Rapp, leasing on the Dante No. 2, has opened a 5-ft. shoot on the 600-ft. level and is shipping a carload of ore per day that averages one ounce of gold per ton.——A compromise has been made between the Hiawatha and El Paso companies regarding the orebody recently opened on the Ida May claim, the ore being divided between the two companies.——W. Horn and associates have opened a new shoot on their lease on the Isabella property and are preparing a shipment of ore that assays $200 per ton.——A carload of smelting ore assaying $45 per ton was forwarded recently from the Lucky Gus claim.——An orebody assaying $40 to $180 per ton has been opened on the seventh level of the Chickenhawk property, and a shipment is to be forwarded at once.——A number of water courses which drain some of the shafts on Beacon hill have been tapped by the Roosevelt tunnel and the water is being slowly lowered in the mine workings. Within the last week the water in the Banner shaft has gone down 10 ft.——A hoist, compressor, and motor are being installed at the Mabel M. shaft.——The Western Investment Co. has commenced work on the Ophir mine upon which it has a long lease.

IDAHO

SHOSHONE COUNTY

The Interstate Mining Co., composed of Duluth and Minneapolis capitalists, has been organized under the laws of Arizona with 250,000 shares of stock at a par value of $10 each, to develop a number of claims near the Hercules mine at Burke. Gus. Carlson, of Hibbing, Minnesota, is president, and H. G. Rodearmel, of Minneapolis, vice-president. Twenty-five thousand shares of stock have been disposed of to provide capital for preliminary work.

A modern bunk house is to be started and the company has already awarded a contract for the cutting of 500,000 ft. of the heavy timber on its claim for mining purposes.——Thomas G. Kennedy, secretary and manager of the Missoula Copper Co., reports a discovery of ore on the Gold Hunter property near Mullan. Eight feet of galena was opened by cross cut from the bottom of the shaft sunk from the lower level.——Reports were submitted to stockholders of the Black Horse Mining Co., at Wallace, that the 150-ton mill will be in operation in 60 days.——The Iron Mountain Tunnel Co. has discovered a rich galena outcrop near the top of the mountain on the Iron Mountain claim. The outcrop is 3 ft. wide and assays 190 oz. lead and 30 oz. silver per ton. The new orebody can be reached by extending the adit on the 1600-ft. level for 500 ft. Heretofore operations on the Iron Mountain property have been confined to one orebody 50 ft. long though recently the management has discovered several new shoots. The mill is being increased to 150-ton capacity.

MISSOURI

JASPER COUNTY

(Special Correspondence).—The largest mining deal for several weeks was last week closed when the Mrs. D. V. Scholl tract, at Porto Rico, was sold for a large figure to an Oklahoma company. The land has been well developed by five drill holes showing ore at 240 ft. where the mineral runs 8 to 20% zinc, with a 15-ft. face. This makes one of the richest sheet ground mines in the district.——One of the richest mines now at work in the district is the Green Dog, where a rich discovery was recently reported. As work advances the ore grows more abundant so that for two weeks the company has turned in a ton of concentrate per working hour.——Another promising producer is the Lima mine in the South Carterville camp, where two recent finds have been important. A drill rig put in an old abandoned shaft which had been sunk to 100 ft., struck a rich vein of ore after only a few feet of operation. The ore was said to run 15 to 20%, and continued to 121 ft.——On an adjoining lease the new Tom Sawyer mill has started operations and is working on a rich deposit at 230 ft., where the ore runs 15%.——On the Centre Creek land, at Webb City, the Mercedes company is planning to take up a stope of 20 ft. extending from 170 to 190 ft. Operations were conducted at 170 ft. and a high drift was worked. There is still ore beneath the 190-ft. level.——In the extreme northern field there are as promising developments as can be found in the entire district. The land first developed by the Quick Seven Co. is yielding a high grade of ore, mainly zincblende, from 55 to 170 ft., with the cuttings averaging 10%. The remarkably high face and the richness of the ore attracted wide attention and brought numerous operators into the field, so that there are now in the vicinity a number of companies operating large mills.——To the west of Neck City, the Cliffwood company is operating steadily on the new mill, producing last week 80 tons of ore assaying over 62%.——In the main Joplin camp several important discoveries have been made. In the vicinity of Toms Station, the deepest find, so far made there, was found by S. L. Bradley on a lease of the General Zinc Co., at a depth of 251 ft. Other holes will be sunk.——The Granby company, the largest land-holding company in the district, has sunk a shaft in Poor Man's gulch and has cut a good run of ore from 105 to 120 ft. The 15-ft. face yielded 5 to 7% ore with no showing of lead. This land was one of the richest of the shallow mining camps in the early days, the place deriving its name from this source. The operations were then mere gouges in rich lead pockets.

Joplin, August 27.

MONTANA

GRANITE COUNTY

(Special Correspondence).—The Sunday mine, situated near Princeton, has passed to the control of Arthur V. Corry, of Butte, who is putting up a small cyanide plant to treat a dump of tailing that accumulated some years ago. It is estimated this dump material contains $13 to $15 per ton. The mine has been leased to Allen & Co., of Butte, who are to reopen it.——L. L. Lacunis is operating the Shakespeare mine and the Royal Gold Mountain. He is installing a hoist and air compressor and has let a contract for 2000 cords of wood. This is twelve miles from Philipsburg.

Philipsburg, August 26.

JEFFERSON COUNTY

(Special Correspondence).—The Boston & Alta Copper Co., M. L. Hewitt, manager, is developing and exploring below the old workings in the Alta mine at Corbin. Within the last year a new 2-compartment shaft has been sunk 300 ft. in rhyolite close to the portal of the old Alta adit. A cross cut has been driven 300 ft. from the 675-ft. station of the new shaft, opening a vein which contains good ore. It is not certain that this is the Alta vein. This cross cut is tapping the orebodies about 100 ft. below the lowest of the old workings. The Alta vein is on the contact of granite and rhyolite, and has an average width of 10 ft. The ore in the higher levels yielded silver and lead but at greater depth it became a copper iron sulphide, containing gold, silver, and copper, the greater value being in copper. The old adit, through which the ore was hauled in early days, consists of a 600-ft. cross cut, and a 1500-ft. drift. The property is equipped with a Nordberg electric-driven air compressor, and a hoist operated by compressed air. The electric power is supplied at the company's plant in Prickly Pear valley. No ore is being shipped at present. A force of 20 men is employed.——The Corbin Pennsylvania Mining Co. is developing a property which contains an extension of the Alta zone. A 150-ft. shaft has been sunk between two veins, which are 250 ft. apart. One of these is the Alta, which on this property is 18 ft. wide, and on a contact between a granite and porphyritic rock; the other vein is 10 ft. wide, and in granite. Both veins strike northeast, and have a dip of about 70°. The ore is composed of chalcopyrite and bornite, accompanied by some silver. One car of hand-sorted ore, shipped in 1902, sampled 9% copper, and 29 oz. silver per ton. H. E. Emerson, manager for the Boston & Corbin Co., has charge of this development; H. M. Brooks, of Corbin, is secretary of the company.

Corbin, August 26.

NEVADA

ESMERALDA COUNTY

Two new bodies of commercial ore have been opened in the Victor workings of the C. O. D. Consolidated, at Goldfield, at a depth of 400 ft., and development has been started to determine the extent of the shoot.——The workings of the Vinegarone claim of the Jumbo Extension are being sampled and surveyed that the engineers representing the owners may have a complete record of the underground development.——The engine and compressor recently purchased for the Phoenix lease, at Rawhide, has arrived at the mine and will be installed as rapidly as possible.—— The Queen mill has completed a run on 114 tons of ore from the Grutt Balloon Hill lease cleaning up about 700 lb. of amalgam.

NYE COUNTY

(Special Correspondence).—The Tonopah mines are shipping about 7750 tons of ore per week, valued at approximately $193,700. It is expected that the total production for August will approximate $850,000, said to be the largest output for any month in the history of the camp. Tonopah of Nevada is producing 3500 tons per week; Belmont, 1865 tons; Montana, 1050 tons; Tonopah Extension, 840 tons; West End, 325 tons; MacNamara, 120 tons; and Midway, 50 tons.——The enlargement of the Belmont shaft from two to three compartments has been completed within 150 ft. of surface, and it is expected to complete the work within 60 days.——Extensive exploration is under way in the north portion of Midway, with work centered at the 435 and 1035-ft. points. Ore is being stoped on the south vein, above the 235-ft. level, on the No. 3 vein, 335-

ft. level, and on the Brougher vein, at the 435-ft. level. From the latter point a north cross-cut is being driven in an endeavor to pick up new veins in an entirely new portion of the mine.——The Steen lease on Big Four, at Manhattan, is arranging to sink a 500-ft. shaft near the old workings. Under the terms of the lease this shaft must be completed before any ore is extracted.——The Peterson mill is running steadily on custom ore.——The Wilson lessees on Wolftone Extension are making weekly shipments of bullion to Tonopah.——John Kelley has acquired the Allison lease and is thoroughly prospecting the ground. ——The Round Mountain Mining Co., operating at Round Mountain, has declared a dividend of 4c. per share, payable September 25, to stockholders of record September 20.

Tonopah, August 27.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence).—The pipe-line of the Helen Mining Co. up Whitewater creek is completed and a small force is engaged in finishing the details of power station. The plant will probably be started within two weeks.—— Grading for the mill at the Deadwood mines is nearly completed. The shaft crew is making good progress. Driving continues on the 400-ft. level, the south face of which is in fine ore from which 75 tons were added to the broken reserve the past week.——At the Socorro mines 1292 tons of ore were milled during the week and 12 bars of bullion shipped. This company is now producing approximately 100 lb. of refined gold and silver every 24 hours as well as large quantities of high-grade concentrate. Additional zinc-boxes are soon to be installed as an essential for the proper precipitation of the increased value in the solutions. Development in the sixth or lowest level shows a continuance both east and west of the large vein.——The winze of the Enterprise Mining Co. below the second level continues in a fair grade of ore. A contract has been let for driving a cross-cut to the foot-wall on No. 5 level.——The Oaks company acquired other claims and added to the tunnel group during the week.

Mogollon, August 26.

UTAH

JUAB COUNTY

James Sorenson and J. W. Knight have secured a lease on the Salvador property in the Eureka district and will install a cyanide plant to treat the low-grade ore.——Sinking is continued at the Iron Blossom, the shaft being down over 1760 ft. About 80 tons of ore per day is being shipped from the 500-ft. level of the No. 1 workings.——Work is to be resumed in the Tintic Gladiator incline shaft, which is down 100 ft. The ground is east of the Iron Blossom, and a good surface prospect has been opened.——The Chief Consolidated has opened a new shoot in the main drift on the 1400-ft. level.

SUMMIT COUNTY

It is reported that a body of ore has been opened on the 1900-ft. level of the Daly West property at Park City, conditions on that level showing a general improvement. This shoot has been cut on the 1700, 1800, and 1900-ft. levels and a contract has been let to drive a cross-cut to it on the 2100. Despite continued rumors of curtailment of forces the company is laying in large supplies on mining timbers and coal.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—Two gold bars were shipped from the Nugget mine in the Nelson district during the past week, valued at $10,000. On the Golden Fawn property, which adjoins the Nugget, a vein four feet wide, giving assays up to $200 per ton, is being developed. Two adits are being driven on the property, one of which is in 100 and the other 200 ft.——The Eureka mine, on Eagle creek, which has been under development for the past couple of years, will begin shipping to the Trail smelter in a week or two. It is the intention to make regular shipments.——The zinc-lead miners of this district note with interest that the Dominion Government has started the experimental work in zinc smelting, for which $50,000 was recently appropriated. A small plant has been built at Ottawa for some preliminary experiments, though it is highly probable that the final work will be carried out at the Nelson smelter.——The Pacific Exploration Co. is planning to develop the power of the Pend Oreille river near its confluence with the Columbia. Just below the mouth of Priest river the Government Reclamation Service made some measurements, the lowest of which was 5419 cu. ft. per second, in February 1905, the next lowest figure was 7852 cu. ft. per second, some 30 days previously. It is possible to obtain a head of 40 to 53 ft. along the Pend Oreille at this point. The International Electric Co., in which it is supposed the Canadian Pacific Railway Co. is interested, purposes to use 4000 cu. ft. per second from the Pend Oreille at a point near the Salmon river, under a head of 53 ft. Assuming a switchboard output of 70%, this would permit of the delivery of 12,720 kw., but it is not probable that more than 5000 kw. will be developed to start with. This power could be used with advantage in the Sheep Creek district, the Pend Oreille valley, Metaline, Chewelah, and Orient.——Toronto capitalists have bought an interest in the Evans group, St. Marys district, for $10,000. The ore contains copper, gold, silver, and nickle, and the formation is said to be similar to that in the Sudbury nickle district.——At a regular meeting of the Le Roi Mining Co. held in London, August 18, it was decided to go into liquidation; A. J. McMillan, erstwhile managing director of the company at Rossland, to be liquidator.—— A bond has been taken on the old Waterloo and Fontenroy property, Camp McKinney, by Victoria capitalists.——The contract for an extension of the Kettle Valley railway has been let to a Seattle firm. The contract covers 35 miles from Rock to Bull creek. Construction is to begin within two weeks.——The International Mining & Milling Co. will expend $25,000 in machinery to work three miles of leased ground it has near Lillooet. The property was recently examined by W. S. Reinbold, who is very sanguine of profitable results. The office of the company is in Everett, Washington.

Rossland, August 27.

ONTARIO

The City of Cobalt company forwarded another 30-ton shipment of concentrate to the smelter recently. The operators are stoping on four levels and treating about 40 tons per day at the Northern Customs Co.'s concentrator. The ore assays 25 to 30 oz. silver per ton.——The McKinley-Darragh has declared the regular 3% quarterly dividend with a 2% bonus payable October 1. This makes a total of 15% for this year.——The Porcupine Mine Owners' Association has been formed to maintain a publicity bureau for the camp and protect investors from becoming interested in 'wild-cat' stocks.

CHINA

(Special Correspondence).—There are valuable deposits of stibnite and antimonial oxide near the city of Changsha, and F. A. Schiertz, representing the Allis-Chalmers Co., is superintending the erection of furnaces at this city for the treatment of these ores. The government controls the antimony mines, and has a monopoly of the business. Recently a plant to produce arsenious acid from sulphide ore was built at Hankow by Scharz-Gaumer & Co., but it was not a success and is idle. The only metallurgical establishment in operation near Hankow, aside from the Han Yang Steel Works, is the concentrating mill of Carlowitz & Co. This antimony-lead smelter, owned by the same firm, is now closed. The concentrating mill includes a system of crushers, trommels, jigs, and vanners. The concern is extremely conservative and dislikes publicity. In this plant 45 tons of ore are treated each 10 hours—the working day. The ore contains lead and zinc carrying silver. The concentrate is shipped to Germany.

Hankow, August 1.

Personal

Professional men are invited to send items of their engagements and travels. Such items will be gratefully received.

C. S. HOWE has gone to Reno, Nevada.

H. D. MCCASKEY has gone to San Francisco.

A. C. VEACH was in San Francisco last week.

CHARLES JANIN has gone to Bakersfield, California.

W. E. THORNE has left San Francisco for Dawson, Yukon Territory.

W. MORRISON WILLEY left San Francisco for New York last week.

HOWARD D. SMITH will leave San Francisco for London, September 5.

S. BRADSHAW JACOBS is agent for the A. S. & R. Co. Pachuca, Mexico.

L. S. JOHNSON is with the Compania de Sta. Gertrudis Pachuca, Mexico.

R. B. BRINSMADE is studying mining methods in the anthracite coalfields.

FRED T. WILLIAMS is at Big Pine, California, making a mine examination.

R. C. SPECHT is at present sampling placer ground in Shasta county, California.

HENRY D. BODDINGTON has gone from El Paso, Texas, to Philadelphia, Pennsylvania.

J. P. SMITH has gone to Cosala, Sinaloa, Mexico, to take charge of the Nuestra Señora mine.

ROBERT MUSGRAVE is at Sultepec, Mexico, for the Exploration Company of England and Mexico.

WALTER HOWARD CRAWFORD has returned to Boston after spending the summer at the sea shore.

EDWIN E. CARPENTER is now at Guanajuata, Mexico, in the interest of the Just Extraction Company.

H. H. LANG, superintendent for the Kendall Gold M. Co., Kendall, Montana, has returned from California.

C. E. ALLEN, of the United States Smelting, Refining & Mining Co., visited Judith Basin, Montana, last week.

GEORGE OATES ARGALL is to be married at Denver, September 7, to RUTH BOEHMER, daughter of MAX BOEHMER.

JAMES BREEN, of Spokane, principal owner of the Cumberland mine, at Maiden, Montana, was at the property last week.

WILLIAM F. JONES is making a geologic examination of the Carbon Hill Coal Co.'s properties at Carbondale, Washington.

EUGENE B. RAIL, one of the California pioneers well known in connection with early mining on the Comstock lode, died at San Francisco August 29.

J. A. CARPENTER has resigned as professor at the Mackay School of Mines and is assayer and surveyor for the West End Consolidated at Tonopah, Nevada.

W. L. WATTS, formerly connected with the California State Mining Bureau, was married August 7, at Los Angeles, to the widow of the late JAMES STERLING.

JUAN FELIX BRANDES has returned to California from Paris by way of Chihuahua, Mexico. He will be in Denver at the end of this month going from there to Paris again.

A. BEMENT was married August 23 to Miss Eva Henderson, at Berkeley, California. While on their wedding trip last week both Mr. and Mrs. Bement were badly injured by being thrown from a stage on Mt. Tamalpais. They are recovering nicely.

THE San Francisco Section of the Mining & Metallurgical Society of America will meet following dinner at 6:30, September 5, at the Palace Hotel.

Market Reports

LOCAL METAL PRICES

San Francisco, September 1.

Antimony	12—[illegible]	Quicksilver, flask	65
Electrolytic Copper	13½—13¾	Spelter	5 [illegible]
Pig Lead	4 5—5 6¼	Tin	38—[illegible]

METAL PRICES

New York, September 1.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver per oz.
Aug. 26	13 [illegible]	4 40	5 [illegible]	[illegible]
" 26	13 5/8	4 40	5 [illegible]	63 [illegible]
" 27	13 [illegible]	4 40	5 [illegible]	63 [illegible]
" 28	Sunday	No market		
" 29	13 5/8	4 40	5 [illegible]	62 [illegible]
" 30	13 5/8	4 40	5 [illegible]	62 [illegible]
" 31	13 [illegible]	4 40	5 [illegible]	63 [illegible]

ANGLO AMERICAN SHARES

Cabled from London

	Aug. 25 £ s. d.	Aug. 31 £ s. d.
Camp Bird	1 8 6	1 9 1½
El Oro	1 6 9	1 6 9
Esperanza	2 15 0	2 15 7½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 1	0 6 3
Mexico Mines	8 17 6	8 17 6
Tomboy	0 18 3	0 18 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON

	Closing prices Sept. 1.		Closing prices, Sept. 1.
Adventure	6	Mohawk	47⅝
Allouez	30	North Butte	57¼
Atlantic		Old Dominion	36
Calumet & Arizona	59	Osceola	122
Calumet & Hecla	580	Parrot	13
Centennial	18	Santa Fe	1⅜
Copper Range	65½	Shannon	9¾
Daly West	6	Superior & Pittsburg	11⅜
Franklin	10	Tamarack	66
Granby	31	Trinity	51½
Greene-Cananea, ctf.	7	Utah Con.	23⅜
Isle-Royale	18⅛	Victoria	3
La Salle	10	Winona	8
Mass. Copper	7¼	Wolverine	128

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Aug. 31.		Closing prices, Aug. 31.
Amalgamated Copper	64⅝	Miami Copper	18⅞
A. S. & R. Co.	67⅝	Mines Co. of America	⅜
Braden	8½	Montgomery-Shoshone	1⅛
B. C. Copper Co.	4¼	Nevada Con.	20⅞
Butte Coalition	18⅞	Nevada Utah	⅝
Chino	14⅝	Nipissing	10¾
Davis Daly	1¼	Ohio Copper	2
Dolores	⅞	Ray Central	2⅛
El Rayo	3¼	Ray Con.	18⅛
Ely Central	⅞	South Utah	1¾
First National	3¼	Superior & Pittsburg	11¾
Giroux	6½	Tenn. Copper	25⅝
Guanajuato Con.	¼	Trinity	6
Inspiration	5⅛	Tuolumne Copper	2⅛
Kerr Lake	6¼	United Copper	5
La Rose	3⅞	Utah Copper	46¼
Mason Valley	7¼	Yukon Gold	3¼

COMSTOCKS.

San Francisco, September 1.

Alpha	$ 8	Hale & Norcross	$ 33
Alta	11	Julia	10
Andes	18	Justice	10
Belcher	94	Kentuck	10
Bullion	18	Mexican	1.35
Brunswick Chollar	25	Occidental	46
Brunswick Potosi	24	Ophir	1.37
Caledonia	42	Overman	69
Cassidy	24	Potosi	42
Challenge Con.	16	Savage	20
Chollar	19	Scorpion	10
Confidence	75	Seg. Belcher	20
Con. Imperial	4	Sierra Nevada	24
Con. Virginia	1.37	Silver Hill	6
Crown Point	94	Union	40
Exchequer	20	Utah	5
Gould & Curry	23	Yellow Jacket	60

(By courtesy of San Francisco Stock Exchange.)

SOUTHERN NEVADA STOCKS.

San Francisco, September 1.

Atlanta	$ 12	Mayflower	$ 4
Belmont	4.00	Midway	22
Booth	12	Montana Tonopah	87
Columbia Mtn	5	Nevada Hills	2.15
Combination Fraction	42	Pittsburg Silver Peak	49
Daisy	4	Rawhide Coalition	12
Fairview Eagle	40	Rawhide Queen	24
Florence	2.15	Round Mountain	45
Goldfield Con	8.25	Sandstorm	4
Gold Kewenas	9	Silver Pick	7
Great Bend	3	St. Ives	18
Jim Butler	29	Tonopah Extension	87
Jumbo Extension	43	Tonopah of Nevada	8 50
MacNamara	28	West End	62

(By courtesy of San Francisco Stock Exchange.)

OIL SHARES.

San Francisco, September 1.

Alma	$ 1.00	Occidental	$ 20
Apollo	11	Palmer	1.47
Associated Oil	40.75	Paraffine	1.00
Bay City	2.40	Pinal	6.50
Brookshire	1.54	Premier	90
Caribou	15.00	Record	4.00
Claremont	1.40	Republic	50
De Luxe	1.50	Sauer Dough	1.85
Empire	3.00	Silver Tip	1.75
Enos	1.25	S. W. & B.	31
Fulton	2.00	Sterling	2.00
Illinois Crude	46	Turner	1.30
Jade	20	Wolverine	25
Monte Cristo	2.90	W. K. Oil	2.75
Nevada Midway	22	Yellowstone	30

(By courtesy of San Francisco Stock Exchange.)

CURRENT PRICES FOR CHEMICALS

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as specified. For round lots lower prices may be expected, while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min.	Max.
Acid, sulphuric, com'l, 66°, drums, 100 lb	$0.90	$1.25
Acid, sulphuric, com'l, 66°, carboy, 100 lb	1.00	1.50
Acid, sulphuric, C.P., 9-lb. bottle, bbl., lb	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb	0.09½	0.12
Acid, muriatic, com'l, carboy, 100 lb	1.70	2.00
Acid, muriatic, C.P., 6-lb. bottle, bbl., lb	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb	5.25	6.50
Acid, nitric, C.P., 7-lb. bottle, bbl., lb	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb	0.12½	0.15
Argols, ground, bbl., lb	0.20	0.25
Borax, cryst. and conc., bags, 100 lb	2.75	3.85
Borax, powdered, bbl., 100 lb	3.00	4.00
Borax glass, ground, 30 mesh, kegs, 100 lb	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb	4.50	5.50
Bromine, 1-lb. bottle, lb	0.55	0.65
Candles, adamantine, 12 oz., 40 sets to case	3.50	4.15
Candles, adamantine, 14 oz., 40 sets to case	4.00	4.55
Candles, Stearic, 12 oz., 40 sets to case	4.95	5.50
Candles, Stearic, 14 oz., 40 sets to case	4.65	5.20
Clay, fire, sack, 100 lb	1.50	2.00
Cyanide, 98 to 100%, 100-lb. case, lb	0.20¾	0.24¾
Cyanide, 98 to 100%, 200-lb. case, lb	0.20	0.24
Cyanide, 125 to 127%, 100-lb. case, lb	0.27½	0.28½
Cyanide, 125 to 127%, 200-lb. case, lb	0.26¾	0.27½
Lead acetate, brown, broken casks, 100 lb	8.75	9.00
Lead acetate, white, broken casks, 100 lb	10.00	10.25
Lead acetate, white, crystals, 100 lb	11.75	12.25
Lead, C.P., test., gran., 100 lb	13.00	15.00
Lead, C.P., sheet, 100 lb	15.00	18.00
Litharge, C.P., silver free, 100 lb	10.50	13.00
Litharge, com'l, 100 lb	7.00	8.50
Manganese ox., blk., dom. in bags, ton	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton (85% MnO_2—¾% Fe)	45.00	50.00
Mercury, 75-lb. flask	46.50	47.50
Nitre, double ref'd, small cryst., bbl., 100 lb	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb	7.25	18.00
Potassium bicarbonate, cryst., 100 lb	12.00	15.00
Potassium carbonate, calcined, 100 lb	15.00	18.00
Potassium permanganate, drum, lb	0.11	0.12½
Silica, powdered, bags, lb	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb	1.50	1.75
Soda, bicarbonate, bbl., 100 lb	2.00	2.50
Soda, caustic, ground, 98%, bbl., 100 lb	3.15	3.50
Soda, caustic, solid, 98%, bbl., 100 lb	2.65	2.85
Zinc dust, 1400-lb. casks, 100 lb	8.65	9.65
Zinc shavings, 800 fine, bbl., 100 lb	10.50	11.50
Zinc sheet, No. 9—18 by 84, drum, 100 lb	9.50	10.50

CURRENT PRICES FOR ORES AND MINERALS

(Corrected monthly by Atkins, Kroll & Co.)

The prices are approximate, subject to fluctuation, and to variation according to quantity, quality, and delivery required. They are quoted, except as noted, f.o.b. San Francisco.

	Min.	Max.
Antimony ore, 50%, per ton	$25.00	$35.00
Arsenic, white, refined, per lb	0.03	0.03½
Arsenic, red, refined, per lb	0.08	0.09
Asbestos, according to length and quality of fibre, per ton	100.00	350.00
Asbestos, lower grades, per ton	10.00	100.00
Asphaltum, refined, per ton	15.00	20.00
Barium carbonate, precipitated, per ton	42.50	45.00
Barium chloride, commercial, per ton	42.50	47.50
Barium sulphate (barytes), prepared, ton	20.00	30.00
Bismuth ore, 10% upward, per ton	75.00	upward
Chrome ore, according to quality, per ton	5.00	15.00
China clay, per ton	15.00	20.00
Cobalt metal, refined, f.o.b. London, per lb	2.50	
Coke, foundry, per 2240 lb	15.00	17.50
Diamonds:		
Borts, according to size and quality, per carat	2.00	15.00
Carbons, according to size and quality, per carat	75.00	100.00
Feldspar, per ton	5.00	25.00
Firebrick:		
Bauxite, per M	175.00	200.00
Magnesite, per M	200.00	250.00
Silica, per M	47.50	
Flint pebbles for tube-mills, per 2240 lb	15.00	25.00
Fluorspar, per ton	8.00	15.00
Fullers earth, according to quality, per ton	10.00	30.00
Gilsonite, per ton	32.50	45.00
Graphite:		
Amorphous, per lb	0.01	0.02½
Crystalline, per lb	0.04	0.13
Gypsum, per ton	2.50	5.00
Infusorial earth, per ton	5.00	15.00
Magnesite, crude, per ton	5.00	7.50
Magnesite, dead calcined, per ton	22.50	27.50
Magnesite, brick (see firebrick).		
Manganese ore, oxide, crude, per ton	10.00	25.00
Manganese, prepared, according to quality, per ton	45.00	125.00
Mica, according to size and quality, per lb	0.05	0.30
Molybdenite, 95% MoS_2, per ton	400.00	500.00
Monazite sand (5% thoria), per ton	150.00	200.00
Nickel metal, refined, per lb	0.45	0.60
Ochre, extra strength, levigated, per lb	0.02½	0.03½
Platinum, native, crude, per oz	20.00	25.00
Quicksilver, per flask (75 lb.)	45.00	48.00
Scheelite (see tungsten ore).		
Sulphur, crude, per ton	15.00	25.00
Talc, prepared, according to quality, per ton	20.00	50.00
Tin ore, per ton	250.00	400.00
Tungsten ore, 65%, per ton	475.00	525.00
Vanadium ore, 15%, per ton	120.00	150.00
Wolframite (see tungsten ore).		
Zinc ore, 50% up, per ton	15.00	20.00
Zinc dust, 90% minimum, per 100 lb	8.50	9.50
Zinc oxide, per 100 lb	7.50	8.50

JOPLIN LEAD AND ZINC PRICES

The *News-Herald* figures for the week ended August 20 are as follows. The zinc-ore surplus was cut down more than 2000 tons last week, blende selling at $41 per ton on a 60% basis. The high price was $44. Calamine sold for $20 per ton on a 40% basis, the record being $26. Lead ore averaged $50 per ton, with pig lead quoted at $4.32½ and spelter $5.15 per hundred. The total production of the district was blende, 12,821,085 lb., valued at $246,238; calamine, 1,117,720 lb., $13,969; and lead, 1,409,635 lb., $35.952.

COMMERCIAL PARAGRAPHS

T. H. PROSKE has just shipped a D 24 Ajax drill sharpener to the Mijnbouw Maatschappij Sintoeroe at Sambas, Dutch Borneo.

THE CLEVELAND ROCK DRILL CO., Cleveland, Ohio, advises that The Smith-Booth-Usher Co., of Los Angeles has been appointed as one of its agents.

MERRILL precipitation processes and presses are to be installed at the Santa Gertrudis, Pachuca, Mexico, having been selected after a series of tests conducted by Godfrey D. Doveton.

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EDITORIAL

BANKING apparently has no great attraction for Mr. George E. Roberts, who has resigned as president of the Commercial National at Chicago to resume his old position as Director of the Mint. This is an excellent appointment.

CONSERVATION is the topic of the hour at St. Paul this week, where the second annual session of the Conservation Congress is being held. With a list of speakers including Mr. Taft, Mr. Roosevelt, Mr. Pinchot, Mr. Garfield, Mr. Hill, and Governors too numerous to mention, it is no wonder that the Congressional investigating committee postponed consideration of the Pinchot-Ballinger matter. Several Western Governors withdrew, finding that the plan of turning over to each State the public lands within its border was decidedly unpopular. Mr. Roosevelt criticised this plan severely, and who, familiar with Western political history, shall say his strictures were not well founded? The time may come when the trusteeship may be safely transferred to the States, but it is becoming increasingly clear that first steps, at least, must be taken by the Federal Government. Mr. Taft's contribution to the discussion was notably informing and judicial. His demand for specific criticism and suggestions, correctly voices the need of the hour and leads to hope that important advances may be made at the next session of Congress. Popular objection to the attitude of the Administration in conservation matters has been less to the President's legislative program, which is sane and constructive, than to his choice of advisers and assistants in administration.

A RECENT writer in the *Atlantic Monthly* has contrasted delightfully Jonathan Edwards, who went as a missionary to the Indians in such spirit that "our sympathy goes out chiefly to the Indians," with Dr. W. T. Grenfell, who likes Labrador and tells of it so enthusiastically that he "fires the minds of growing boys with the desire to run away and be missionaries themselves." The same contrast is reflected in the story Mr. J. A. MacDonald tells in this number of the young engineer disgusted with Mexico, as compared with his own enthusiastic account of summer travel in that country. Mr. MacDonald writes with a pen touched with *simpatio*. Hardships disappear and the rough trail is made smooth. Snakes vanish and even 'jiggers,' it is pointed out, are small if pestiferous, and may be cured "by bathing in coal oil." We hear the song of the *cuitaceche* and are fired with ambition to start at once in search of the lost Gloria Pan mine. It must be easy to find! All this, as Mr. MacDonald

says, is the value of temperament. Would that the schools did more to develop it in the young men who go out to run mines. There would be fewer failures, since on the outpost of civilization the man in command must furnish not only technical knowledge but inspiration for his whole force. An ounce of optimism is sometimes worth as much as a ton of dynamite. We commend Mr. MacDonald's article to all who retain any of the spirit of adventure.

Bureau of Mines and the Director

The President has appointed Mr. J. A. Holmes to be the head of the Bureau of Mines and thus a vexatious controversy has been settled. We congratulate both the men of the Bureau and Mr. Holmes. His administration we believe will be an excellent one, and we look forward confidently to the disappointment of his enemies who feared in him a Director 'unfriendly' to the Geological Survey. In our judgment there never was any foundation for this fear. The whole contest has been as disturbing and harmful as it was unnecessary. Mr. Holmes is a Southerner by birth, a graduate of Cornell University, and a gentleman who, as professor of geology in the University of North Carolina, as State Geologist of that State, as Chief of the Department of Mines and Metallurgy at the Louisiana Purchase Exposition, and as Chief of the Technological Division of the U. S. Geological Survey, has displayed signal ability. He is far seeing, and tactful. He has the confidence of both men and operators in the coalfields and, while less well known among metal miners, has many sturdy friends throughout the West. The new Bureau, to be successful, must be the servant of all. It does not belong to the men, neither is it the peculiar property of the operators. Both coal and metal mining problems must be studied by its officers. It must be free from sectionalism or partisanship, and it must be kept on a high plane as regards scientific accuracy. It is the province of the Bureau to get at the facts as regards safety and waste in mining, and it may well leave to others responsibility for using that knowledge to remedy evils. It may be, and probably is, true, that the mine-run system of payment for coal mining increases waste and decreases safety. That is a proper matter for investigation and report by the officers of the Bureau; but whether the system must none the less be maintained, will be determined by economic conditions and is a matter for negotiation between the operators and men concerned. The Bureau will be responsible only for ascertaining and publishing the facts so that men, operators, and public shall be informed. It is not the province of its officers to work out a flow-sheet for some Congressman's mill, nor for the friend of some Congressman; but it will do a useful work if it continue, for example the studies of colloids begun by Mr. H. E. Ashley, and indicate the possible metallurgical uses of the data, as we understand Mr. Ashley, now transferred to the Bureau of Standards, is to show their relation to the ceramic industries. The metallurgists expect help on the deeper problems of chemistry and physics. They are abundantly able to make practical application of the material as the Bureau furnishes it to them. What we need is fundamental science studied in the light of the needs of the industries; something of that attention to first principles and systematic research that has enabled German industries to grow so notably and so rapidly. The new Director has a wide field, a magnificent opening, and the hearty support of the mining profession. We confidently anticipate that he will measure up to his opportunity and that the new bureau itself will prove to be what its friends have urged it would become, a great agency for the development and betterment of mining and metallurgy.

Transportation in Alaska

Striking figures with reference to the cost of transportation in Alaska have recently been presented by Mr. A. H. Brooks in his report to the Director of the Geological Survey on the 'Mineral Resources of Alaska in 1909.' He estimates that the present annual freight bill for every white man, woman, and child living in the Interior and on Seward Peninsula, is $350. In 1909, 47,000 tons of freight were received at Nome, and, allowing for ocean and inland charges, the total transportation cost was approximately $1,200,000 or nearly 30 per cent of the value of the gold output. In the Yukon basin the total annual charge for freight is between $4,500,000 and $5,000,000; nearly 50 per cent of the value of the gold output. The freight bill for the entire country is estimated at between $7,000,000 and $8,000,000 of which 30 per cent, approximately, represents the cost of ocean haulage. The total shipments from the States to Alaska for the year ended June 30, 1909, were valued at $17,000,000, and the return products at $30,000,000. There is no probability of great decreases in ocean or river charges, and it is worth noting that but for the extensive river system, the interior of Alaska would be as yet, wholly inaccessible. Despite large use of the rivers, freight on general merchandise to Fairbanks costs $73 to $146 per ton. The rate on lumber is $109.50 per thousand feet, and machinery takes practically merchandise rates. Fairbanks is the most important inland Alaska city, and to many other points rates are much higher. The mining camps near Fairbanks have the great advantage of being connected with it by railway, and yet it is evident that under existing considerations nothing but rich gold ore can be worked. Until better and cheaper transportation is afforded, the interior of Alaska must remain unused and unusable except as man may succeed in mining the richest parts of the placers and bonanza portions of quartz veins.

Yet there is abundant and rapidly accumulating evidence to the effect that the resources of Alaska other than gold are large and well worth development. Mr. Brooks and his associates have presented such complete and consistent proof of this that it is not necessary to cite evidence. Mr. T. A. Rickard in 'Through the Yukon and Alaska,' has shown, as have others, that the country is neither barren nor

frozen, but one where white men may live and work in comfort and with efficiency. The whole history of American experience with Alaska has proved that abundant return for wise investment may be expected. In Europe railways stretch far north of the latitude of Dawson, Fairbanks and Nome, and this month the International Congress of Geologists is being royally entertained at Stockholm, but a trifle farther south than is Cordova, Alaska. It is true, as Mr Brooks carefully points out, that railways to the interior of Alaska would need to look to the mines for tonnage, but this could be done with every prospect that in time agricultural communities would spring up in the region made accessible.

The most important railway now under construction is the Copper River & Northwestern, a standard gauge line extending north over a hundred miles from Cordova. It is expected that it will be completed to the Chitina by November. From there to Fairbanks the distance is 240 miles but immediate construction is not anticipated. The Copper River & Northwestern is the road financed by the Morgan-Guggenheim syndicate primarily to reach the Bonanza copper mine. Incidentally some work has been done on a short branch to connect with the Bering River coalfield. A large amount of money has been spent on the enterprise. So far private capital alone has been drawn on. As an investment the road cannot be considered as other than doubtful since it is a large enterprise to be dependent upon a single mine. The proposal to take it over and extend it to the Yukon valley as a national project has much to commend it despite popular suspicion. Alaska is now in much the same condition as were the Western States and Territories before the trans-continental lines were built. When the Union Pacific was extended west from Council Bluffs it was not on the basis of freight earnings, but as a national defense against possible disunion, and to secure development of the public domain. That it made money incidentally was a fortunate though unexpected outcome. General Grenville M. Dodge, the chief engineer, has told how, when there was an effort to make a showing for the possible commercial success of the line, he had to figure in all the trans-Pacific as well as trans-continental traffic that existed and charge 'all the traffic would bear,' and even then was forced to make large drafts on his imagination. Today no one doubts the wisdom of building that road and with the accumulated experience of the years and the present higher standards of public conduct it should be possible to build railways in Alaska on terms fair both to the public and to private interests. Whether it be done by concession, contract, or by direct government construction, is a minor matter provided that the arrangement be honest and fair. The general concensus of opinion seems to be that in the Philippines American Government officials have worked out and applied a feasible plan, and it ought not be impossible to do here at home among our own people, what has been done half way around the world in a district inhabited by those whose interests and habits of thought differ so strongly from our own. The Copper River & Northwestern railway is only mentioned here as an illustration. There are other lines and other routes and the best should be selected. It would seem wise, however to attempt first to complete what has been largely done by some private company provided a satisfactory agreement be reached. In any event Americans should frankly face the fact that provision of railways to interior Alaska is a National duty. It is as much a Government function to build a railway as a wagon road. The latter, however well it be made, must inevitably be incomparably less efficient. It has never been required that wagon roads be assured in advance of enough traffic to pay interest and sinking funds on the investment. Why then should railways? The question becomes especially pertinent in the particular case under consideration. A rich and prosperous Alaska will be worth more to the Nation than several dreadnaughts — and will cost less. Mining men have a special interest in the matter since the first development in the country must be that of the values concentrated in the ore deposits. They have also a special responsibility since they, as a class, know Alaska best. It is time that they made their influence felt. We have no sympathy with the idea that Conservation necessarily means cold storage any more than that anti-social exploitation is the only form of development. Between the two is a mean that is just and reasonable and it should be the part of practical statesmanship to guide the Nation along that path.

Viva Mexico!

"*Viva la Independencia! Viva Mexico!*" Thus exclaimed Miguel Hidalgo y Costilla on the night of September 15, 1810, and the echo of that famous *grito* has sounded across the century which has intervened. Again on the night of September 15, 1910, it will be repeated with redoubled force by a nation which has witnessed the fruition of independence and has felt the material blessings that it brings. On September 16 the Mexican people will hold up for the adulation of the world a list of noble heroes, Hidalgo, Morelos, Matamoras, Rayón (patriot, metallurgist, and journalist), Mier y Terán, Guerrero, Felix Fernandez, in whom the celestial patron of the Revolution is honored in the name of Guadalupe Victoria, which he assumed as conquering soldier and as first President of the Republic. We need not pry curiously into the occult to explain the part which a reverent faith in the power of *Nuestra Senora de Guadalupe* played in achieving the freedom of Mexico. The virgin of Tepeyac stood for the fiat of heaven upon the new order of liberty and spiritual equality, superseding the old régime of mental and bodily bondage. She was the protectress of the down-trodden Indian, confessed as their loving mother in a hundred miracles; and when Hidalgo flung the banner of Guadalupe to the breeze he also flung in that same act the religious fervor of a whole race, with its dogged will and fatalistic contempt of death, against the waning strength of Spain.

Mexico is also celebrating the crowning glory of

her first century of autonomy in honoring Porfirio Diaz. It is a matter of simple coincidence that his birthday falls on the day of the *grito*, not a subtle political convenience as was the shifting birth-date of the great Napoleon, but it is a happy juncture. It throws into more prominent relief the merit of the man who made a unified nation out of warring factions. What he has done the world knows; how it might have been done differently is useless speculation; how it might have been done better is material for closet philosophers to demonstrate for the entertainment of the idle; several gentlemen, possessed of more daring than statesmanship, had the same opportunity as Diaz, and they failed. The time, the place, and the man, for the peace and prosperity of Mexico, is a trinity that came into conjunction when the great pacifier first assumed the reins of authority in 1880. A country that had never enjoyed financial credit has been lifted by him to so high a level that her securities passed the recent financial throes with no more than a momentary depression, in which the bonds of even the lending nations participated. Her industries have been developed under enlightened policies that are eclectic but not imitative. Her tariff is protective in principal, but liberal to the needs of consumers, while at the same time it is less fiscal in purpose than our own, or that of Germany or of France. Her mines have been favored in the past by laws admitting duty-free the initial plant required, and by a system of claim-tenure which renders it impossible to hinder legitimate enterprise by maintaining unproductive possession, except at large expense. It is an accentuation of the ancient law that has filtered down from Chaldaean sources, making use of the supreme test of right. Foreign capital has been welcomed, protected, and accorded advantages which have even caused the native-born Mexican to feel at times that a discrimination were made against him. Railroads have been built and administered under a system which we might wisely emulate. The problem of their nationalization has been solved without resort to absolute ownership, and the roads are responsible, through the need of maintaining a market for their bonds, to the bourses of the world instead of to a government bureau. Thus public administration and economical efficiency in operation are combined. In the face of powerful opposition by what we are now accustomed to call 'special interests,' Mexico delivered herself from the humiliation of bondage to speculators in silver, by stabilizing exchange, and leaving the manipulators in Paris, Bombay, and Shanghai, to buy her white metal as an article of simple merchandise. The monetary glamor was extinguished, and though many mine owners lamented the days when they could pay their labor in the depreciated product of their *haciendas* under a system of free coinage, the result has been to stimulate the development of other ores and to greatly diversify the mineral output of the Republic. From the days of thrilling romance when bandits waylaid *conductas* in the Sierras, Mexico has come to a condition of peace and safety, facilitating intercourse and mutual trust, without which the conveniences of a broad banking system could not have been realized. Thus the conduct of business has been facilitated, and the waste of a fluctuating currency eliminated, by the sound policies introduced through the efforts of the great financial minister, José Ives Limantour, whom Diaz had the discrimination to select.

Well may Mexico celebrate the establishment and guarantees of present peace, along with the homage which she pays to the liberators who fought and died for her freedom! Well may she honor the fame of her living statesmen who shed lustre upon the memories of those who are dead and gone! It is our fortune to join, as do all the nations of the earth, in honoring the heroes of Mexico. Her independence has lessened our own political difficulties. The importance to us, as a matter of international security, that there should be a Mexico for the Mexicans, was seen when Secretary Seward sent a curt message by a rough soldier to the gentleman from Austria. But let us not flatter ourselves, in joining heart and hand in these Mexican centennial festivities, that we are celebrating an echo of our own Glorious Fourth of 1776. The separation of Spanish America from the Mother Country received less stimulus than is commonly believed from our defiance of George III. Henry Clay's speech on the Panama Congress would have been so misunderstood as to excite a smile among the dons of Mexico and Lima and Buenos Aires. The Latin American uprising was part of a quite independent course of political evolution. Fundamentally the line of cleavage between Anglo-Saxon and Latin reconstructionists follows the divergent attitudes of the two peoples toward authority. The Spanish American considers the 'supreme government' as supreme; the constitution appeals less to his regard. The Anglo-Saxon touches his constitution with reverent hands, but makes short shrift of assumptions of absolutism in the executive (with due apologies to Mr. Roosevelt). The Colonial Congress passed the Declaration of Independence and fought it out, despite changing fortunes of war, to the end: the Mexicans were true to their traditions in the '*Plan de Iguala*,' which recognized the sovereignty of Fernando VII if resident in Mexico. It was a case of hair-splitting to ease the political conscience, no doubt, but it was effective, and in principle as far as the antipodes from the document signed by the patriots of seventy-six. The northern colonists had been fed on the doctrines of Pym and others of like ways of thinking, while Latin America had listened to the philosophy of the Abbé Raynal, and to the subsequent 'Rights of Man.' In their own way they won the liberties of their choice; they have suffered from dictator to dictator, as distinguished from our trials with the bosses who hold in their hands the will of the triumphant majority. In the end they have found stable political life under the unvanquished Porfirio. He has gathered about him able men who stand sponsors for that stability, Enrique Creel, José Ives Limantour, Olegario Molina, and their colleagues; and, on this festal occasion, we greet them and the nation they love and serve, with '*Viva la Independencia*!' *All's well with Mexico*!

Concentration at Cananea, Mexico

By W. Lawrence Austin.

A distinguishing feature of the mill work at the concentrator of the Cananea Consolidated Copper Co. is the close watch maintained upon the results obtained at every stage of the process. There is no working in the dark. The duty of every machine is a matter of record, and its maximum output is known through special tests upon each grade of ore subject to treatment. The mill has been frequently described, but it is constantly undergoing alteration in order to increase the percentage of

Cananea Concentrator.

saving. The following description represents the plant as it was in the month of April, 1910. The mill is in duplicate sections, each of which has a nominal capacity of 700 tons daily of a mixture of the Cananea ores, but when treating talcose ores from the Oversight mine the duty of each section is 900 tons per diem. The ore will be followed through the mill, so that the account here given will in effect be a flow-sheet, with details of results obtained.

The ore from the crushing plant is received in six steel bins of 467 tons capacity each. The ore has been crushed to pass a 1-in. ring. It is delivered from these bins to conveyor F by six automatic pan-feeders. The conveyor, which is the standard Robins equipment, is 450 ft. long, and is of 16-in., 4 and 6-ply conveyor belting. It runs at a speed of 235 ft. per minute, with an inclination of 18° from the horizontal, and has a life of over 36 months, transporting 1400 tons of ore per day. The driving of this conveyor requires 10 hp. The belt delivers its

The analysis of the average ore feed, made on samples taken by an automatic sampler over the fine-ore bins, shows, copper 2.88%, insoluble 64.8, iron (Fe) 11.2, sulphur 12, silver 0.4 oz. per ton, gold trace. The screen analysis of the feed to one section of the mill is as follows:

	Weight Per cent.	Tons Per day.	Copper Per cent.	Copper Tons.
On ⅝-in. trommel	24.0	168.0	2.76	4.637
On ⅜-in. trommel	11.0	77.0	1.76	1.355
On ¹/₁₀-in. trommel	11.5	80.5	2.00	1.610
On 2 mm. trommel	8.8	61.6	2.50	1.540
Through 2 mm. trommel	44.7	312.9	3.53	11.045
Total	100.0	700.0	2.88	20.177

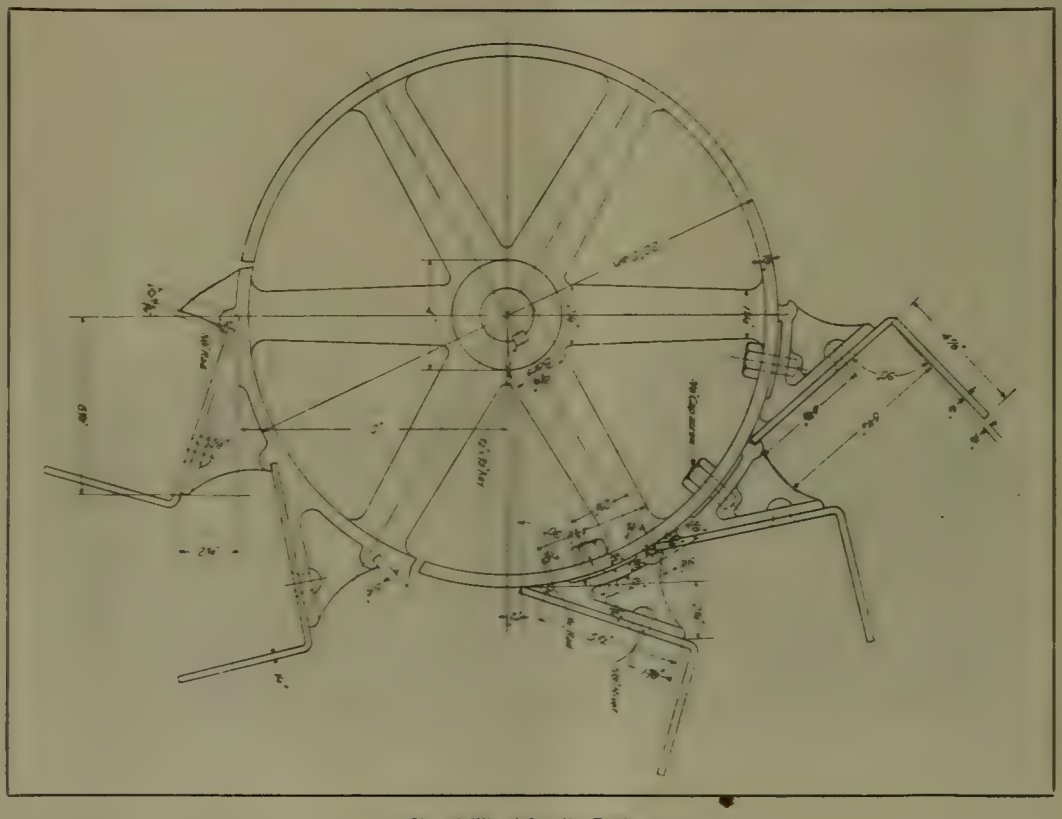
The ore at this point is discharged from the conveyors, and water is added, carrying it to two ⅝-in. trommels. These are 48 by 60 in., passing 700 tons of mill-feed per 24 hours, with the addition of 108 gal. of water per minute. The oversize produced is 24% or 168 tons, which goes to the 'bull-jigs.' The 532 tons of undersize goes to the ⅜-in. trommel.

The latter is set with an inclination of ¾ in. per foot, and makes 16 rev. per min. It is built of four pieces of punched steel sheet, ⅛ in. thick, with ⅝-in. round holes, spaced 1 in. centre to centre, rolled lengthwise to a diameter of 48 in. The average life of the screen is 30 days, doing a duty of 0.1 lb. of screen worn out per ton of ore passed.

The two bull-jigs, handling 168 tons of oversize, have a screen 24 by 40 in., of No. 12 wire. The plunger is 21 by 40 in., making 115 two and one-half-inch strokes per minute, consuming 2 hp. The screens weigh 21 lb. each, and last 80 days. The depth of bed maintained is 8 in. There is added 96 gal. per min. of water to each plunger. The performance is as follows: from 168 tons of feed, containing 2.76% Cu, is obtained 33.704 tons of concentrate with 5.32% Cu, leaving 134.296 tons of tailing assaying 2.28% Cu, the jig extraction therefore being 38.66%, and the concentration ratio 4.984 into 1.

The bull-jig tailing is de-watered by a Cole shovel-wheel, the construction of which is shown in the accompanying illustration. It consists of a series of shovels attached to the rim of a spoke-wheel, the spokes radiating from an inclined spindle. The wheel is 24 in. diam., weighs 113 lb., and has a life of 36 months. The wheel is of brass, but the 12 shovels are of 1¼-in. scrap-steel plate, and last 30 days. The de-watered tailing is sent to coarse rolls, 16 by 36 in., Allis-Chalmers class B, set to crush to ½-in. requiring 11 hp. The capacity is 132 tons of tailing per 24 hr., with an addition of 45 gal. of water per minute. The shells are made of Midvale steel and weigh 2860 lb., having a duty of 0.156 lb. steel per ton of ore crushed, the life being therefore 150 days. The screen analysis of the crushed product is: on ⅜-in. screen, 39.9% with 2.64% Cu; on ⅛-in., 34 with 1.6 Cu; on 2-mm., 12.7 with 2 Cu; and finer than 2-mm., 13.4% assaying 1.85% Cu. This material is elevated by a belt-driven elevator, having 104 ft. of 18 in., 3-ply belting, carrying 50 elevator buckets, 16 by 8 in. each; the belt making 460 ft. per min. The belt lasts twenty months, and the buckets two months. The discharge is into two ⅜-in. trommels, 48 in. diam., set at an inclination of ¾ in. per foot, making 16 rev. per min. The trommels are in two sections, of two pieces each, made of ¼-in. steel, 76 by 32 in., with ⅜-in. round holes spaced ¾ in. apart, without margin. These handle all the undersize from the ⅝-in. trommel and the jig-tailing, making a total of 656 tons. The oversize, or 136.6 tons, goes to two 1-compartment Harz jigs, the jig-feed containing 2.31% Cu. These jigs are identical with the bull-jigs, but are driven at the rate of 130 strokes per minute. The ratio of concentration is 8.942 into 1, making 15.275 tons of concentrate assaying 5.82% Cu, the extraction being 30.39%, leaving 121.32 tons of tailing with a tenor of 1.68% Cu. The hutch-product is re-combined with the tailing, and this is all de-watered with a Cole shovel-wheel. Of this amount 119 tons are shoveled to fine rolls, Allis-Chalmers class B, set to crush to ¼ in. At this point 45 gal. of water per minute is added.

An elevator delivers this product to a ⅜-in. trommel. The entire 121 tons is obliged to pass this



Shovel Wheel for Jig Tailing.

screen. This is followed by two [illegible] trommels handling 651,021 tons in 24 hr. with a consumption of 32 gal. of wash-water. These trommels 48 in. diam. are of steel screens in four pieces of a total weight of 280 lb. The screen is round punched No. 10 sheet with [illegible]-in. holes spaced [illegible] in. centre to centre with a 1-in. margin on the sides. The inclination is [illegible] in. per foot, and the speed is 16 rev. per min. The oversize goes to two intermediate jigs with 23½ by 35½ in. No. 4 mesh brass screens made of No. 12 wire weighing 18 lb. and lasting fifty days. The plunger is 21 by 36 in., making 165 strokes of 1 in. length, and consuming 1 hp. The feed water to the jigs is 70 gal. per min. The feed contains 1.79% Cu. The concentration ratio of 9.02 into 1 gives a smelter-product of 20.07 tons with 5.72% Cu. The extraction at this stage is 35.36%, leaving 161.02 tons of tailing with a copper content of 1.3%. The hutch-product in this case is part of the concentrate. The tailing is sent to another shovel-wheel which delivers its de-watered product to Bryan mills.

Up to this point there has been abstracted from the pulp-stream 33,704 tons of first jig concentrate, 15,275 of second jig concentrate, and 181,097 tons of intermediate jig-feed. The remaining 469,924 tons are sized through four 2-mm. trommels, giving 101,65 tons of oversize, containing 2.217% Cu, and 368,274 tons of undersize which is sent to Richards 'goggin type' hydraulic classifiers. The jigging at this stage is done on three double 2-compartment Harz jigs, producing 22,097 tons of hutch and pocket concentrate with a tenor of 5.74% Cu, and 79,553 tons of tailing holding 1.24% Cu, the concentration ratio being 4.6 into 1, and the extraction 56.25%. These jigs are provided with 23½ by 35½ in. No. 5-mesh brass screens made of No. 14 wire, weighing 14 lb. each, and lasting 40 days. The plunger is 21 by 35 in., making 170 strokes, 1 in. long, per minute, and requiring 1 hp. The tailing is sent to the shovel-wheel for the Bryan re-grinding mills.

The hydraulic classifiers, handling 368,274 tons of pulp per diem of 24 hr., receive as hydraulic water through the three classifying pockets 120 gal. per min. The discrimination of the classifier is well illustrated by the following comparison between the feed, first spigot, and first overflow:

Grade.	Weight, Per cent. Feed.	Spigot.	Overflow.	Tons, Solids. Feed.	Spigot.	Overflow.	Copper, Per cent. Feed.	Spigot.	Overflow.
On 20-mesh	8.0	24.0	0.5	29.462	28.902	1.239	3.86	2.98	1.80
On 60-mesh	26.0	51.0	13.5	96.751	61.416	83.459	5.03	5.13	2.58
On 100-mesh	10.0	8.0	11.0	36.827	9.634	27.263	1.30	5.88	3.46
On 200-mesh	8.0	2.0	9.0	29.462	2.408	22.306	4.50	5.58	6.18
Sand through 200-mesh	13.0	2.0	16.0	47.875	2.408	39.655	4.62	5.15	5.87
Slime through 200-mesh	35.0	13.0	50.0	128.897	15.657	123.927	1.70	2.22	1.70
Average	...	...	...	368.274	120.425	247.849	3.64	4.30	3.08

It is to be noted that the soluble copper in the feed constituted 0.14%, which of course does not appear in the subsequent products. The second and third spigot-products and the final overflow show equally good results. The following table briefly recapitulates the performance of the classifiers as regards extraction, the figures being reduced for convenience so as to show tons of copper at each stage.

[illegible] the products of hydraulic classifiers [illegible] showed as follows in the last 24 hrs.:

Grade.	Tons Solids	Gal. Water to Ton of Feed	Copper	Water
Feed	[illegible]	1.55	4.87	
[illegible]	120.425	.984	[illegible]	[illegible]
[illegible]	52.964	110	4.60	[illegible]
[illegible]	58.578	[illegible]	[illegible]	[illegible]
Overflow	191.913	746	[illegible]	

The spigot products all go to fine jigs and the overflow to 4-compartment spitzkasten. Four double 4-compartment fine jigs handle 177,261 tons per diem from the classifier, the average copper content being 4.34%. The ratio of concentration is 1.91 into 1, and the extraction is 80.55%. The concentrate amounts to 92,806 tons, assaying 6.68% Cu, and the tailing is 84,455 tons, with a tenor of 1.77% Cu. The jigs have 23½ by 35½ in. screens, and the plungers are 21 by 35 in., making 200 strokes of [illegible] in. per min. Each jig consumes 1 hp. The depth of bed is 4 in. The head-end screens are in one piece, 6 mesh, No. 16 wire, and the tail-end in two pieces, 8 mesh, No. 18 wire. The head-end screens last twenty days, and the tail-end fifteen.

The 4-compartment spitzkasten divides its 191,013 tons of feed into 24% spigot-discharge and 76% overflow. The work of the spitzkasten is seen in the table below:

	Weight, Per cent. Spigot.	Overflow.	Copper, Per cent. Spigot.	Overflow.
On 100-mesh	22.0	15.4	3.80	2.42
On 200-mesh	20.4	2.8	3.85	3.83
Through 200-mesh	12.6	21.0	4.63	4.66
Slime	45.0	60.8	1.82	1.85

The overflow is sent to two pulp-thickeners, 10 ft. diam. by 12 deep, classifying 145,170 tons of pulp into 21.5% spigot-product and 79.5 as overflow, the latter going to another spitzkasten system. The spitzkasten principle is not actually introduced here, the settling being accomplished by circulation of the pulp through 33 rectangular compartments, having a total capacity of 9900 cu. ft., and presenting a superficial area of 2170 sq. ft. These are handling 450 gal. of slime per minute.

As shown above, 325,028 tons of medium coarse jig-tailing, assaying 1.41% Cu, go to a shovel-wheel delivering its discharge to the Bryan mills. Of this, 18% is an overflow of slime and fine sand which is sent to the chip-catcher, and then to the spitzkasten; 82% only reaches the Bryan mills. There are four of these, 5 ft. diam. each, receiving 266,522 tons from the shovel-wheel, and 25 tons of middling from the Wilfley tables, making a total feed to each mill of 72.88 tons per 24 hr. This is crushed to pass a 1½-

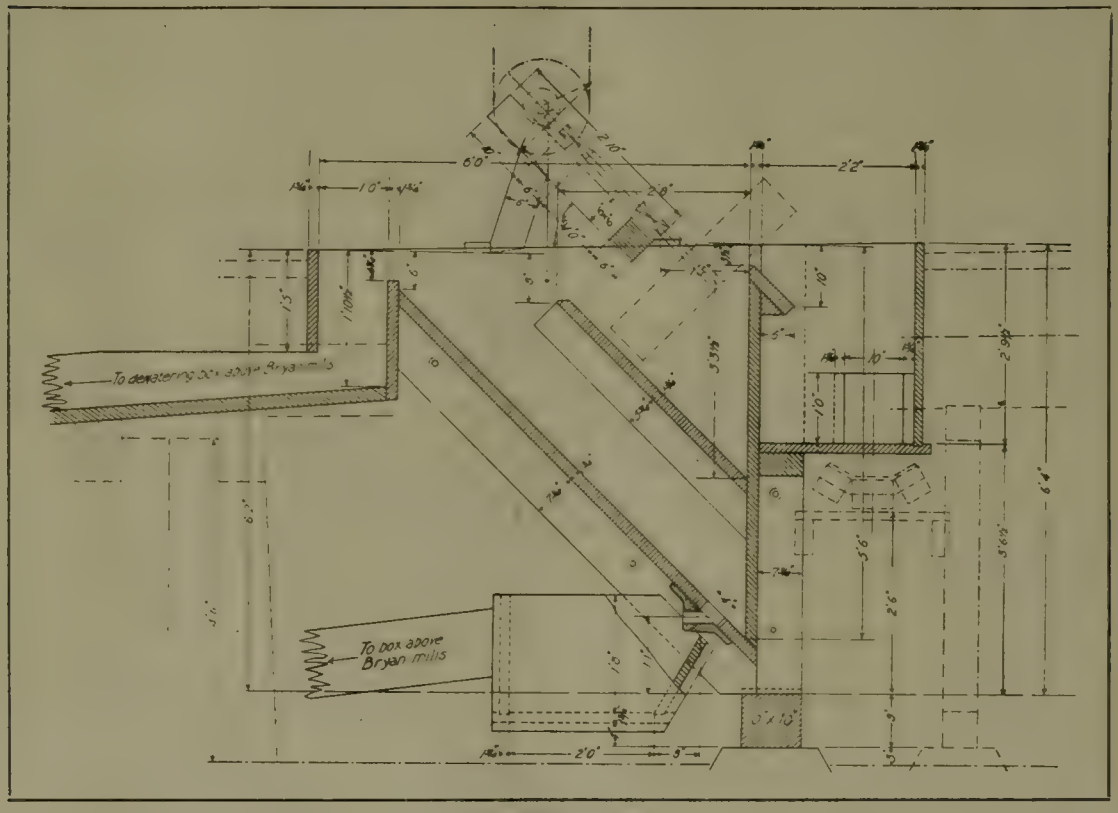
mm. screen, delivering the product to de-watering boxes. The Bryan mills make 39 rev. per min., and require 18 hp. each. The die weighs 1661 lb., and lasts 120 days; the three tires weigh 3672 lb., and have a life of 240 days; and the five screens weigh 19 lb., and are worn out in four days. The following screen analysis represents an average of the crushed product from the Bryan mills:

Grade.	Weight Per cent.	Pulp per day Tons.	Copper Per cent.	Copper per day Tons.
On 20-mesh	1.9	5.064	0.48	0.243
On 60-mesh	19.0	50.639	0.70	0.354
On 100-mesh	16.0	42.643	1.24	0.529
On 200-mesh	13.9	37.046	1.56	0.578
Through 200-mesh .	8.2	21.855	2.15	0.471
Slime	41.0	109.275	1.28	1.399
Total	100.0	266.522	1.58	3.574

The de-watering boxes receive this product plus the spigot-discharge from the 4-compartment spitzkasten, making 312.365 tons in all, assaying 1.59% Cu. or 4.959 tons per diem. Of this total 92% is drawn off through a spigot and led to hydraulic classifiers for Wilfley table and fine-jig feed, while 8% overflows to round-tanks for the vanner-feed. The two classifiers, which are of the Richards goggin type, take 287.376 tons of pulp, assaying 1.56% Cu. and make four products, as follows: first spigot 60.50 tons, 1.8% Cu; second spigot, 36.20 tons, 2.18% Cu; third spigot, 20.54 tons, 1.89% Cu; overflow, 170.136 tons, 1.3% Cu. Hydraulic water at the rate of 150 gal. per min., is used, and the classification ratio is 2.26 into 1, making 117.24 tons of fine-jig and Wilfley-table feed, and discharging 170.136 tons to another spitzkasten, which treats this amount per day, making a fine-table feed of 50.42 tons, concentrated on six Wilfleys, and 119.716 tons of overflow which goes to a centrifugal pump delivering to the round-tanks.

The fine-jigs are two in number, of 3 compartments each, taking a total of 48.25 tons per diem, containing 1.8% Cu. and producing 9 tons of 5.9% concentrate, showing a concentration ratio of 5.36 into 1, and a 60.47% extraction. These jigs are fitted with screens 24 by 36 in., the head-screen being 6-mesh, and the tailing-screen 8. The bed is only 2½ in. deep, and the 21½ by 34½-in. plungers make 240 quarter-inch strokes per minute.

Nineteen Wilfley tables treat 109.41 tons of classifier and spitzkasten sand per day. The feed contains 1.84% Cu. The daily output of concentrate is 17 tons, with 7.6% Cu, the concentration ratio being



Jig-Tailing Separator.

7.024 into 1, and the extraction 58.62%. The tailing amounts to 76.43 tons, with a copper tenor of 0.619% Cu. It is interesting to note that the head-water with the Wilfley-table feed contains 1.13% Cu. The 25 tons of middling are returned to the Bryan mills by an elevator 86 ft. long, made of 11-ply belting, with sixty 8 by 5-in. buckets. The elevator belt is driven from a head pulley 24 in. diam., and has a speed of 356 ft. per min. The buckets last five months.

A 6-in. centrifugal pump, working against a head of 25 ft., handles 119.716 tons of pulp and 25.98 tons of slime to three round-tanks, 10 by 18 ft. An 18-ft. elevator lifts the round-tank discharge to eighteen

6-ft. vanners. These have smooth belts 12 ft. long driven 12 ft. in 2½ min. and set with an inclination of ½ in. per foot. The feed is composed of the following grades:

Grade	Weight Per cent	Solids Tons per day	Copper Per cent	Copper Tons per Day
On 60-mesh	4.4	6.410	0.42	0.027
On 100-mesh	7.0	10.198	0.78	0.071
On 200-mesh	27.0	39.337	1.00	0.393
Through 200-mesh	12.0	17.483	2.19	0.28
Slime	49.6	72.268	1.19	0.859
Total	100.0	145.696	1.19	1.733

The extraction is 54.24% on a concentration ratio of 11.48 into 1, the total concentrate being 12.691 tons assaying 7.26% Cu. The 133.005 tons of tailing carry only 0.6% Cu. These go to the tailing launder, and are sampled on the way to the dump by an improved Scobey sampler, belted to the vanner drive-shaft, and cutting the whole stream once every seven minutes.

Another spitzkasten takes 58.505 tons of slime overflow from the Bryan-mill shovel-wheel tank, making 50 tons of pulp for the Wilfleys, and 8.505 tons of slime which goes to an Aldrich pump. There is also a 4-pocket classifier handling 31.211 tons of spigot-discharge from the pulp-thickeners, and 50 tons from the previously mentioned spitzkasten. This makes a roughly classified feed of 81.211 tons to eight Wilfley tables. The Aldrich pump is of the triplex plunger type, 13 in. diam., 10 in. stroke, making 32 strokes per minute. Its capacity is 800 gal. per min. It handles 400 gal. per min., plus 8.505 tons of slime, delivering its load to the feed-water box at the head of the mill.

The eight Wilfley tables treat 81.211 tons of pulp and 5.24 tons of the middling made. The feed contains 2.03% Cu; the concentrate amounts to 8.517 tons with 9.2% Cu, being a concentration of 9.64 into 1, and an extraction of 48.03. The 72.694 tons of tailing, assaying 1.2% Cu, is discharged into the tailing-launder.

From the large spitzkasten 113.959 tons of slime are sent to eighteen 6-ft. vanners, making 10.2 tons of concentrate, raised from 2.38% Cu in the feed to 10.52 in the finished product. The ratio of concentration is 8.14 into 1, and the saving is 38.68%. The tailing, 103.759 tons, with 1.63% Cu, is delivered to the tailing-launder.

The succeeding table illustrates the extraction of one section of the mill up to this point the distribution of the extraction being shown in percentages of the whole sand in the last column:

Machine.	Concentrate Tons.	Copper Per cent.	Copper Tons.	Sand Per cent.
Jig No. 9	33.704	5.32	1.793	11.27
Jig No. 14	15.275	5.82	0.890	5.59
Jig No. 19	20.077	5.72	1.148	7.22
Jig No. 22	22.097	5.74	1.268	7.97
Jig No. 24	92.806	6.68	6.199	39.00
Jig No. 34	9.000	5.90	0.531	3.34
Wilfleys No. 35	17.000	7.60	1.292	8.12
Vanners No. 40	12.691	7.26	0.921	5.79
Wilfleys No. 45	8.517	9.20	0.783	4.92
Vanners No. 47	10.200	10.52	1.073	6.72
Totals	241.357	7.00	15.898	100.00

The tailing is large to be [illegible] above [illegible]

Machine	Tailing Tons	Copper Per cent	Copper Tons
Jig No. 4	39.350	0.86	0.338
Wilfleys No. 5	26.420	0.81	0.214
Vanners No. 40	13.005	0.60	0.81
Wilfleys No. 45	71.694	1.20	0.84
Vanners No. 47	103.759	1.63	1.591
Overflow No. 48	34.594	1.20	0.414
Totals	458.643	1.03	4.750

The ratio of concentration is 2.9 into 1, and the total extraction of copper up to this stage of the process is 77.07%. The tailing from both sections of the mill, 905.287 tons in all, is received in a coarse-sand tank, which is an inverted pyramid, 12 by 12 by 12 ft., having a capacity of 612 cu. ft. Through a ⅞ in. spigot 292.672 tons are discharged, assaying 0.65% Cu, leaving 612.609 tons of overflow containing 1.21% Cu. The spigot-product is sent to the tailing pond, and the overflow to the fine-sand tank, 24 by 12 by 9 ft., with a wedge-shaped bottom, having a capacity of 1380 cu. ft. The four compartments discharge through eight ¼-in. spigots, combining their product with the fine sand from the mill, which all goes to the fine-sand plant where it is concentrated on 10 Card tables and 40 Frue vanners. The Card tables receive 53 tons assaying 0.98% Cu, yielding 2.258 tons of concentrate with 5.7% Cu. The concentration ratio is 23.47 into 1 and the extraction 24.74%. The 50.742 tons of tailing go to a settling tank, the clear water from which is sent to the precipitating plant. The 40 Frue vanners treat 215 tons assaying 1.12% Cu, and yield 7.945 tons of concentrate assaying 9.2% Cu. The tailing amounts to 208.055 tons, with a copper tenor of 0.81%. The concentration ratio is 27.06 into 1, and the recovery 30.35%. The same disposal is made of the tailing as in the case of the Card-table tailing. The total feed is classified, the spigot going to the Card concentrators and the overflow to the vanners. The concentrate is elevated to the railroad bins, and the tailing is discharged at intervals from the settling-tank to the tailing-pond. At this point a recovery of 250 gal. of clear water per minute is effected.

The overflow from the above fine-sand tanks and fine-sand tailing tanks, is treated in four sections of V-bottom tanks with 77 compartments, 5 by 32 ft. each, and 8 ft. deep, making a superficial water-area of 12,320 sq. ft. The pulp carries only 4.05% solid matter, but the total solids amounts to 1300 tons daily, with a copper-tenor of 1.2%. The spigot-product consists of 325 tons of fine sand assaying 1.42% Cu, and 975 tons of what is called in this mill 'absolute slime,' containing 1.04% Cu, or 10.14 tons of copper, while at the same time 1500 gal. of clear water per minute is recovered.

The slime-plant treating this material consists of fifty 6-ft. corrugated-belt Frue vanners, with a belt-travel of 12 ft. in 2½ min., the inclination being ½ in. per foot. The total daily feed is 460 tons, of which 96% will pass a 200-mesh screen. The copper content of the feed is 1.16% Cu. The concentrate produced is 13.403 tons, assaying 7.53% Cu.

leaving 446,597 tons of tailing carrying 0.97% Cu. The concentration ratio is 34.32 into 1, and the extraction 18.9%. The second recovery made on the tailing discharged past the Scobey samplers is as follows:

Machine.	Concentrate Tons.	Copper Per cent.	Copper Tons.
Card tables	0.537	5.70	0.031
Sand Vanners	1.891	9.20	0.174
Slime Vanners	3.350	7.53	0.254
Totals	5.778	7.94	0.459

This amounts to a further saving of 10% of the copper discharged from the upper mill. It should be stated that this subsequent concentration plant represent an annex to the old mill.

The total water recovered from the settling system, including tailing-tanks, is 3000 gal. per min., to which the overflow from the concentrate bins adds 900 gal. This quantity is raised 150 ft. by two, Aldrich, triplex, vertical, belt-driven, plunger pumps 18 by 18 in., requiring 40 rev. per min. The pump-column is 16 in. diam., and the indicated horse-power is 225. The water is received by two round tanks at the head of the mill, each having a storage capacity of 100,000 gallons.

The Scobey tailing-sample is at intervals carefully screened wet, then dried, and each size weighed and assayed. The residues are panned, using a pan for the coarser products, and a plaque for the finer. The results of such a test are shown in the following table, on the basis of one ton:

Grades.	Weight Per cent.	Weight Pounds.	Copper Per cent.	Copper Pounds.	Pan concentration, Ratio.
On 20-mesh	2.5	50.00	0.82	0.21	217.39
Pan concentrate	...	0.23	0.42	0.01	into
Pan tailing	..	49.77	2.60	0.20	1
On 100-mesh	27.0	540.00	0.41	2.48	99.0
Pan concentrate	...	5.45	0.46	0.18	into
Pan tailing	...	534.55	3.40	2.30	1
On 200-mesh	11.5	230.00	0.43	1.15	30.99
Pan concentrate	...	7.47	0.53	0.46	into
Pan tailing	...	222.53	6.16	0.69	1
Through 200-mesh	10.8	216.00	0.31	3.89	5.53
Pan concentrate	...	39.05	1.80	3.37	into
Pan tailing	...	176.95	8.64	0.52	1
Slime	48.2	964.00	0.29	12.27	
General tailing	100.0	2000.00	1.27	20.00	38.31
Pan concentrate	...	52.20	1.00	4.02	into
Pan tailing	...	1947.80	7.70	15.98	1

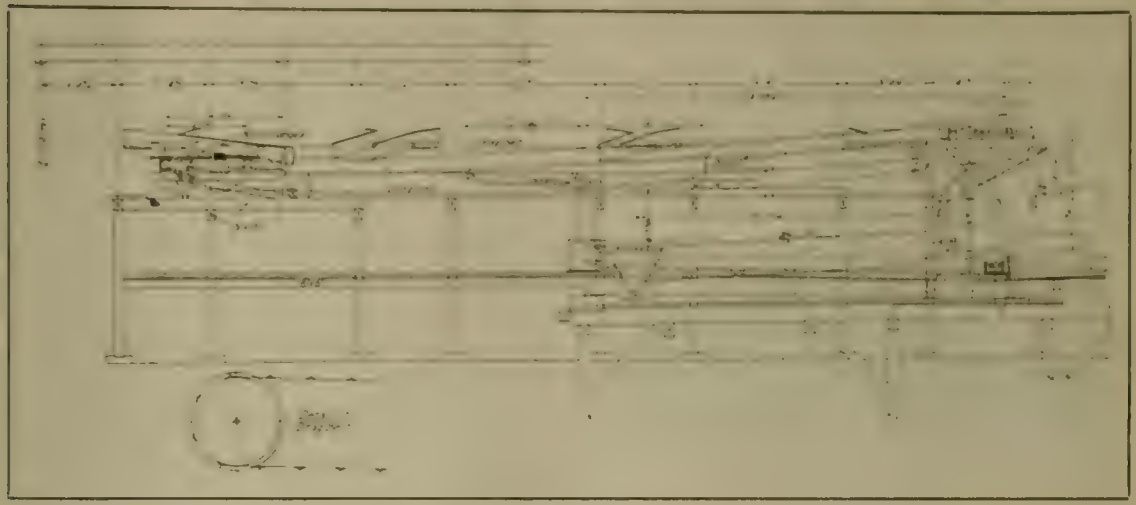
The pan and plaque concentration thus represents a possible saving of 20.1% against an actual recovery by Card tables and vanners of 10%. The general sample of the tailing finally discharged to the tailing pond carries 0.84% Cu. while the pan-tailing shows a possible minimum of 0.82. L. D. Ricketts, general manager for the Cananea Consolidated Copper Co., acting under the conviction that, as the waste of past generations of miners is ore to the present metallurgists, so the depleted tailing, carrying only 0.82% copper, may be valuable in the days to come. Hence it is carefully impounded. The tailing-launder is provided with a series of pockets, 12 ft. centre to centre, which discharge across the width of a deep gulch, and, flowing toward the up-canyon side of the tailing-wall thus produced, it builds a sloping dam that has proved safe against the pressure of the impounded water as well as against the wash of floods in the rainy season, the latter being further cared for by a spill-way. The catchment-area tributary to the canyon above the dam is relatively small. A floating barge is placed at the head of the pond, carrying a centrifugal pump, electric-motor driven, which pumps 1100 gal. per min. of the greenish coppery water through wooden pipes to the precipitating tanks. The tailing-dam now stands 90 ft. high, with a slope from crest to toe having a mean of about 40°. The sand in this tailing-dam has a maximum diameter of 1.5 millimetre.

The elaborate investigation of every detail of the milling process here is conducted under the direct guidance of David Cole, the assistant general manager for the company. Mr. Cole is the designer of the exceedingly simple and efficient de-watering shovel-wheel previously mentioned and illustrated. He has also designed a simple and clever separator for dividing sand from slime, which is now being used to prepare sand and slime for different concentrators in the plant. This so-called 'drag-belt separator' consists of a long shallow trough, with a slack belt traveling in it and held down by an idler so that scrapers on the outer side of the belt just escape the bottom at mid-length. The pulp enters at one end, the settling sand as it accumulates is dragged forward and over the farther end of the trough at a speed of 50 ft. per min., while the slime overflows by a weir-notch along one side, extending one-third the length of the trough. The following screen-analysis demonstrates the efficiency of the apparatus:

Grades.	Feed Weight Per cent.	Slime Weight Per cent.	Sand Weight Per cent.
On 20-mesh	1.1	...	10.2
On 40-mesh	5.1	...	21.8
On 60-mesh	9.1	...	22.9
On 80-mesh	3.8	...	8.8
On 100-mesh	6.4	5.6	10.5
On 150-mesh	11.1	10.9	10.7
On 200-mesh	4.7	5.4	2.5
Through 200-mesh	8.1	11.7	5.1
Slime	44.0	64.0	4.1

As the ore to mill varies, the extraction also fluctuates within normal operating limits. The saving during the month of April, to which the foregoing

outside supplies was 78.81, and the total daily expense of concentrate ready to ship to the reduction works smelter averaged the equivalent of 191.27 tons of metallic copper. The labor required for this plant, treating 1400 tons per diem, is as follows: one mill foreman, $175 per month; one head foreman, $3 per 10 hr. shift; one engineman, $3.40 per each 8 hr. shift; one valveman, $3.40 per 8 hr. shift; one engineer, $4 per 8 hr. shift; three machinists at $4.25 per each 10 hr. shift. These constitute all the Americans employed. The Mexican labor consists of two pit men, two millmen, two stablemen, and 10 van men, each at ₱3.50 per each 8 hr. shift; four helpers at ₱2.50 per each 8 hr. shift. There is also a repair gang of four Mexicans receiving ₱4 each, and 87 teodermen at ₱3. For loading concentrate there



Cole Drag Belt Scraper.

are six Mexicans paid ₱3.50 per day each, and one American foreman receiving $4. The sampling is under the direction of an American receiving a salary of $125 per month, under whom are four helpers who are paid ₱3.50 each for an 8-hr. shift. Common labor is employed in many situations, bringing up the total number of men engaged in and around the mills, to 304.

Honduran mining laws are based on the famous 'Ordenanzas de Mineria' of Spain, and give the alien the same rights as the native. Under this law anyone can denounce up to 1000 hectares (about 2400 acres) for mining purposes and pay a yearly tax of 50c. silver (20c. gold) per hectare. Some 700 mines in all have been denounced. While the country is undoubtedly richest in silver, denouncements have also been made of gold, lead, copper, kaolin, crystal, iron, opal, marble, saltpetre, aluminum, chalk, coal, antimony, zinc, nickel, and asphalt. Petroleum is also found, and an exclusive privilege to extract and export it has been granted. The iron found is said to be highly magnetic and rich copper-silver ore is found in the mines of Guanacostre, in the department of Olancho. A recent discovery of copper in the department of Yoro has been reported, in which the veins are said to run as much as 10, 12, and 14 ft. in width. At the present time only two

[illegible] companies are in active operation in Honduras. The New York and Honduras Rosario Co., operating in San Juancito in the department of Tegucigalpa, is the only one doing work upon an extensive scale. It employs about 1800 men, of whom 30 to 40 are foreigners, mostly Americans. During 1908 it mined and milled 29,616 tons of ore which yielded 976,140 oz. silver and 16,604 oz. gold.

Coal mine accidents in the United States in 1909 are reported in a bulletin of the Geological Survey. The total number of persons killed in the year is given as 2412, injured 7979. The disaster in the mine of the St. Paul Coal Co., at Cherry, Ill., is not included because the report of the Illinois State mine inspectors was made for the fiscal year ended June 30, while the Cherry fire occurred in November. The number killed in the Cherry accident has been reported as 393. The number of non-fatal accidents, 7979, is unprecedentedly high, exceeding the figure for 1908 by more than 1200. The number of fatal accidents, 2412, is smaller by 38 than that for the preceding year. Comparisons are not quite fair, however, because the reports for 1909 were more complete than those for any preceding year. As usual, the greatest number of fatal accidents was due to falls of roof and coal, which were responsible for over 49% of the total number of fatalities. Explosions of gas and dust caused less than 14.5% of the total number of deaths.

In copper mines where the water is strongly acidulated and carries an appreciable amount of copper in solution, the destructive effect of the acid water on the ropes, pump-column, pumps, skips, or cages, and any other iron or steel objects with which it comes in contact, either in the mine or on the surface, may in some measure be abated if the precipitation of the copper on old iron scraps (a common practice at the surface) be done underground before the water is pumped or hoisted to the surface. The reaction of the acid water on the old iron not only precipitates the copper, but removes considerable acid from the water as well.

Deep Mining in Transvaal

By Roland Gascoyne

The question as to the ultimate depth at which it will be possible to successfully mine on the Rand has been attracting the attention for some time, but as the mines increase in depth the limit to deep mining appears to be further removed. Granted that in depth the banket reefs maintain their present average, there is every indication that successful mining operations will be continued on the Rand to a far greater depth than seems possible in any other mining field. Generally speaking the principal anticipated bugbears to the success of deep mining have been two only, increased temperature with depth, and increased pressure of the superincumbent strata. The third, that of deep winding, seems to be losing most of its force as it becomes necessary to wind from such depths as prevail on the Rand today. It does not appear necessary to go into that matter as it is clear that winding in one clear lift from the depth of 5000 ft. presents no unsurmountable difficulty. The question then resolves itself into considering the difficulties attending deep mining on the score of temperature and pressure.

The question of temperature received attention some sixteen years ago when Hamilton Smith wrote a letter on the subject to the *Times*. At that time actual mining on the Rand had only reached about as many hundred as it has thousands of feet in depth today, and the main observations were confined to the Rand Victoria bore-hole. At a depth of 200 ft. the temperature was 67.2°F. and it was recorded that the temperature gradually increased to 95.3°F. at a depth of 2494 ft., which was taken to indicate that at a depth of 3000 ft. the temperature would be 100°F. These observations seemed to show that the temperature increased one degree for every 82 ft. in depth, but for some reason this rapid increase of temperature is not borne out by later observations in other parts of the Rand. In fact, Mr. Smith at the time seemed to doubt the accuracy of the observations.

A year later Andrew J. Crosse made an important series of observations at the Ferreira and Crown Deep mines, at the former obtaining a temperature of 69.1°F. at a depth of 808 ft., and at the latter a temperature of 70.7°F. at a depth of 1030 ft. These observations seemed to show roughly an increase of one degree Fahrenheit for every additional hundred feet in depth; an increase likewise not confirmed by subsequent observations. Four years ago Hugh F. Marriott read a paper before the Institution of Mining and Metallurgy, on 'Earth Temperatures on the Witwatersrand Gold Fields,' in which he gave results of observations made in shafts and bore-holes varying in depth from 500 to 3916 ft. from the surface, no less than seventeen observations being taken at different mines and varying depths. In the Jupiter mine at a depth of 3916 ft. the rock temperature was 83.25°F. From these observations the following results were tabulated, showing an increase to 102.35 F. at 8000 ft. of depth.

Depth feet.	Deg. F.	Depth feet.	Deg. F.
1000	68.75	5000	87.95
2000	73.53	6000	92.75
3000	78.35	7000	97.55
4000	83.15	8000	102.35

The observations show that the results vary somewhat, but the average increase over the whole list of mines where observations were made, showed an increase of underground temperature of 1°F. for every 208 ft. in depth. Since the above observations were made, another 500 ft. has been added to the depth of the deepest mines, and the latest investigations show an increase of 1°F. for every 255 ft. in depth, which, if correct, would seem to indicate that the temperature gradient on the Rand is the lowest in any mining field in the world, not excepting that even at the Calumet & Hecla mines in North America.

It will be seen, therefore, that the deep mines on the Rand will have little to fear from the increase of temperature due to the depth, and that the existing deep mines can double their present depth before experiencing any difficulty or trouble owing to the growing temperature. That this is so is proved by the fact that at the Jupiter mine, well over 4000 ft. deep from the surface, mining operations today are being carried on without any resort to fan ventilation: a condition of affairs which speaks volumes for the ease with which deep mining is destined to be carried on at the Rand. If, in the absence of any artificial ventilation, mining operations on the Rand can be carried on to a depth exceeding 4000 ft., it is evident that with ventilation receiving adequate attention it will be easily possible to carry on work to at least double the present depth. Should the temperature gradient continue to decrease as greater depths are reached, it does not seem unduly optimistic to predict that mining operations may perhaps be carried on to a depth of 15,000 ft. without any serious inconvenience being suffered through the increased temperature due to depth. In making this calculation, it must not be overlooked that the Rand is blessed with a fairly abundant supply of colored native labor, capable of doing manual work at a much higher temperature than white labor, and as the latter can work in the Rand underground atmosphere up to a temperature of 90°F. without feeling any serious inconvenience, and that in a comparatively unventilated mine, it is evident that native colored labor in a properly ventilated mine will be able to give much better results at a considerably higher temperature, and on that account it would probably appear that as regards temperature, deep mining on the Rand has but little to fear.

The difficulty with regard to the growing pressure of the superincumbent strata as the depth increases is one that has not yet been fully realized on the Rand, and it is only during the last few months that the trouble has shown itself in a serious aspect. There have been several instances where damage has been done to the shafts by the subsidence of the strata, especially where pillars left in support of the shaft have been too small or were left strictly in accordance with the local Mine Regulations. These if carried out in mines with a steep inclination, w'l

cause the pillar to be left not proportioned to the best position. That is, at once the pillars are left much larger than actually required.

There seems to be an impression on the Rand that the quartzite hanging and foot walls are so cohesive that even when the whole of the reef is extracted at considerable depths there will be no movement whatever of the hanging wall. As a matter of fact the quartzite will move more rapidly than shale or slate and when it moves it is liable to move freely. This is easily discerned where mining on the long wall system is followed, for when the hanging wall or roof contains a fair proportion of shale, it shows a steady bending movement, but if it be altogether composed of sandstone, the hanging wall, once it commences to subside, sinks rapidly, and frequently in such masses as to completely close the working levels of the mine. That the weight of the superincumbent strata is a factor to be reckoned with is shown by the recent accident at the Cinderella Deep mine, where sixteen natives lost their lives through a pillar collapsing at a depth of 4000 ft. from the surface. During June and July several similar but smaller accidents have occurred on the Rand, thus showing that mining operations are reaching such a depth as to require full recognition of the fact that the hanging wall, once it begins to move at such depths as 4000 ft. and over, will be difficult to control by the old method of leaving pillars.

There are also many engineers and mine managers who believe that beyond a certain depth the strength and cohesive nature of the hanging wall will prevent any movement or subsidence. This view may have been adopted owing to hanging walls over 1000 ft. thick rarely collapsing all the way to the surface and giving such pronounced indications as the presence of surface cracks and fractures. A little observation, however, will show that even where mining operations are carried on over 1000 ft. deep, there is a subsidence of the surface, but before the movement takes place a sufficiently large area has to be excavated underground to admit of the hanging wall moving as a body and before a fracture can be formed at the surface the hanging wall and foot-wall meet and prevent further subsidence. In other ways it is clear that actual subsidence will take place, not only when the whole reef has been worked, but recent indications would seem to show that at the depth some of the mines are now working on the Rand, the hanging wall will collapse in time, notwithstanding the fact that nearly one-half of the reef has been left standing behind in the shape of pillars. The actual time that will elapse before the hanging wall begins to move will naturally depend upon circumstances, but it is clear that the ultimate maximum pressure exerted on any pillars or other supports left must be the actual weight of the superincumbent strata. The Rand quartzites may be taken to weigh 1.222 lb. for each square inch of area one foot in depth, so that for each thousand feet in depth the weight will be 1222 lb. per square inch, and at 5000 ft. deep the ultimate pressure per square inch will be 6110 lb. It follows that at 10,000 ft. the pressure will be 12,220 lb. Experiment has

Ferreira Deep Shaft.

the shape of pillars, that it becomes difficult to establish a rule and only a rough and ready calculation can be made, even if all the circumstances are known. The best method of procedure would undoubtedly be to take the maximum possible pressure as the guide under all circumstances and never allow any condition to prevail underground likely to come into conflict with the necessary rule to be observed against this possible maximum pressure. It is clear that between the depths of 3000 and 7000 ft. the leaving of pillars must be attended with some degree of risk, and if mining operations are to be carried on with the maximum degree of safety, a method of mining will have to be adopted whereby the pillars will be worked out in a minimum time so that as the depth beyond 4000 ft. increases the sooner the pillars will have to be worked. At a depth of 7000 ft. there will be considerable risk in leaving any pillars at all, and then a system of working allied to long-wall methods may perforce have to be employed.

While it is clear that in a good many instances the real dangers due to the pressure ultimately to be reached, do not appear to be recognized, it is satisfactory to notice that steps are being taken to avert the danger. Prominent among them is the adoption of the sand-filling process, whereby all the exhausted areas of the mine are filled solid by water borne tailing. It may be pointed out that there is also a ten-

decay to modify the present system of working so as to better suit the sand-filling process and the most suitable modification seems to be that of leaving much larger pillars so as to permit of secondary working and the working of bigger stopes to be completely sand-filled before the pillars are touched, so that gradually and perhaps unconsciously a method of working is likely to be evolved similar in many respects to the stope and pillar system of working as practised in coal when a moderate depth is attained. As the mines increase in depth even this system of working will become obsolete until at a depth of 7000 or 8000 ft. it seems probable that the long-wall method, coupled with sand-filling, will be adopted. When such a depth as 7000 ft. is reached, the underground conditions, more particularly as regards the inclination of the reef, will be more suited to the adoption of the long-wall method of working than the conditions at the existing depths, and it may be urged that on that account principally, the long-wall system or some modification of it will be adopted, but at all events it seems clear that when such depths are reached the adoption of such a system of working may become general.

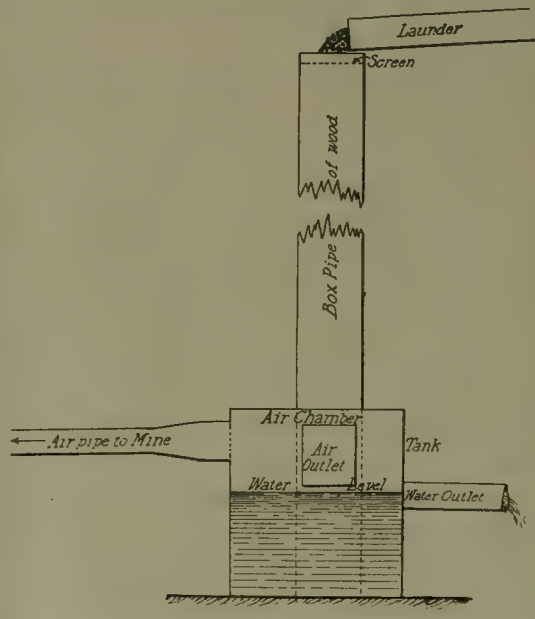
As greater depths are being actually attained on the Rand, the depth limit to deep mining seems to recede until it is wellnigh impossible to fix on a limit. Even the temperature gradient flattens with the increasing depths, and if the temperature at 120°F. be taken as the limit to economical working, the latest observations indicate that this will only be reached in 15,000 ft. from the surface. If, on the other hand, the estimate be based on difficulty caused by the weight of superincumbent strata and compared with the ultimate crushing strength of the Rand quartzites, using the same method of calculation as the last Royal Commission on deep mining in England adopted, a depth of 15,000 ft. as the probable limit to deep mining on the Rand is also reached. Providing mechanical engineers can devise a successful method of winding from such a depth, there seems no reason why the ultimate limit to deep mining on the Rand should not be extended to a depth of 15,000 ft. from the surface.

Crude petroleum often contains water, fine sediment, and sand. If the presence of any, or all, of these in the oil is suspected, they may be detected by pouring a quantity of oil on a clean plate of glass and allowing it to spread over it in a thin even sheet. If water be present it will appear, if held up to the light, as small, bright, light-colored spots on the glass. These may be distinguished from air bubbles by pricking them with the point of a pin. If sand be present in the oil the grains will show as small blisters on the otherwise smooth surface of the oil.

Where there is a scarcity of water for milling purposes, water from the mine is sometimes used, but when this seems necessary where plates are used, it should first be ascertained that the mine-water contains no mineral in solution that is detrimental to successful amalgamation. Some minerals cause discoloration of the plates, and sometimes altogether prevent amalgamation. Arsenic is one of the substances which act in this manner. If the water is to be used in concentration only, the presence of the minerals in solution will make no difference. Salt water is not detrimental to amalgamation.

WATER BLAST FOR VENTILATION

A simple, cheap, and effective means of ventilating mine tunnels, shafts, and other workings, may be applied at any place where a stream of water, having a head of 30 ft. or more, is available. The entire apparatus consists of a wooden box, or pipe, 30 ft. or more in length and 12 inches in diameter, set vertically, and provided with a coarse screen of wire or perforated metal near the top, though this screen is not absolutely necessary, as its chief function is to break up the stream of water into drops. This box must be secured at the top to keep it from falling. This may be easily done by either braces or by building a light trestle out to it from the hillside. The water is brought to the top of the box in a small flume or launder, which discharges into the upper



end of the upright box. The falling drops imprison a large amount of air as they fall, and this air, being unable to escape upward through the falling stream, is carried to the bottom of the pipe, where it escapes through openings in the side of the vertical pipe, and accumulates in an air chamber, from which it passes out through a pipe-line to the working face, or wherever desired in the mine. The force of the current of air depends, to a great extent, on the height of the falling column of water—the higher the water column the greater the force of the air-blast. A 30-ft. fall has been known to drive an abundant supply of air to the face of a drift at a distance of 600 ft. from the ventilating plant. It will be observed that a liberal-sized air-chamber is provided in the tank above the surface of the water, in which the air accumulates. The water-level and outlet in the tank should be several inches below the level of the air outlet to the mine.

Geology of Hostotipaquillo Ore Deposits

By S. J. Lyon.

A complete geological plan of the Hostotipaquillo district in the State of Jalisco, Mexico, even to the narrow limits indicated on the map (Fig. 1) is not now possible, but the following notes at least constitute material toward such a study. They are the result partly of geologic studies made by the writer for Cinco Minas and of the development work incident thereto, working out the position of the orebodies, and partly of later similar work in connection with other properties in the vicinity. The district is now so well known that all reference to any but the geological features may be omitted. The geology is so closely related to the ore deposits as to merit close study. The district in general, though it has produced millions of pesos worth of high-grade ore, will probably be best known in the future for its remarkable extensive deposits of low-grade, silver-gold, milling ores.

Fig. 1. Geology of Hostotipaquil o District.

Whether its copper production will ever become noteworthy is a question for the remote future. The type ore of the district is quartz, cementing a breccia of the country rock, impregnated with sulphides of silver associated with gold; and in some parts of the district with sulphides of the base metals.

The Santiago river seems to be the physiographic axis of the district; on the west side are both early and late flows; on the east side only the early lavas. On the west side occur all the important ore deposits of the area described, with the exception of the San Pedro Analco mines. The ore deposits on the east side are usually in cooling-cracks in the andesite sheet, and are quartz veins impregnated with base sulphides. Galena carrying little or no silver is usually present, generally accompanied by zinc. None of these deposits are of economic importance, save the San Pedro Analco mines already mentioned. The ore deposits are associated in a general way with warm springs, similar to those at Tequisquiapan, in Querétaro, near the Ajuchitlán mines. The principal springs near Tequila are in the Tecomil barranca, and flow altogether about 60 cu. ft. per second, at a temperature of about 70 F. They are scattered from near the top of the mesa down along the barranca for a distance of two miles, nearly to the Santiago river, and gush out of breccia, much decomposed andesite. Similar springs exist near the Esperanza and San José mines, near the river, closely associated with the mineral veins.

The district was formerly one of intense volcanic energy. The country rocks are principally andesite and basalt, with flows of rhyolites. The lavas have at later times been intruded by stocks of diorite. The oldest of the flows is the andesite part of the eruptive sheet that covered so much of the Plateau region in Cretaceous times. The basement rock is exposed in but one place, a deep arroyo tributary to the Santiago river, leading down eastward from the Cerro de Cinco Minas. It is a fine-grained, dark green, diabase rock, showing much hornblende, very heavy, hard, and tough. In the river bed itself it is observable at this point only as loose blocks mingled with other debris. It is in place in the arroyo. A few miles to the north of this point, near the San Pedro Analco ferry, the basement rock emerges as an important uplift of trachyte-syenite, through which the river has cut its way down for over 3000 ft. It appears to have been a peak of the Cretaceous topography, antedating the andesite flows. It is of importance as determining the character of the mineral veins in its vicinity. The andesite sheet barely covered it at the high point, growing thicker as one goes north toward the San Pedro Analco mines. Fissures in the thin portion of the andesite are lean and carry base sulphides; the same fissures further away become strong quartz veins carrying silver, and at some points these become workable deposits.

The andesite shows great variation in color and texture in different parts of the district. At Cinco Minas it is grayish white, fine grained, and shows very few porphyritic crystals; from this it varies through many shades of blue to the dark purple characteristic of the San José region near the river. This phase frequently shows large phenocrysts of feldspar. In the Tequila area the andesite is buried under successive flows of basalt which poured out of the Tequila volcano in Tertiary times, forming the present rim-rock of the river canyon-walls. Here the present thickness of the basalt flows is some 2000 ft. It is well shown in the lower end of the Cinco Minas canyon, near the Balbanera. As one gets farther away from the volcano the basalt thins, finding its northwesterly limit near the Tepic boundary. The Tequila volcano is a conspicuous landmark, being typically conical in form, the top truncated and cup-shaped, with a volcanic plug rising from the centre. Its surface is covered with flow rhyolites, which followed old lines of weakness in making their way to the surface; and with fragments of black obsidian of every size from the smallest to masses of as much as a cubic yard.

The quiet flows of basalt were succeeded by a period of subsidence, during which much of the topography was submerged; explosive eruptions took place from the Tequila centre, obsidian fragments from which are numerous in the conglomerate beds exposed by railway and arroyo cuttings. The

particles forming these beds were evidently sorted under water, and include pebbles of andesite, basalt, and other flows, and in the Balbaneda canyon near Cinco Minas, in conglomerate beds overlying the great rhyolite flow, pebbles of quartz have been observed. The elevation to form the present topography is geologically quite recent.

At no point has the basalt been observed occurring as a dike. The remarkable cooling-prisms shown in the photograph (Fig. 2) were exposed by a cut on the new road built at Cinco Minas. They are nearly horizontal, about 12 ft. long and 3 ft. diam. The horizontal position is due to their having been thrust over from the vertical during the period of vein-formation in the Cinco Minas area. They overlie andesite, which in turn overlies a great stock of dacite, which coming up from the west, as do most of the intrusive masses observed here, carried before it a portion of the andesite sheet, displaced the basalt flows immediately above, and came to rest near the top of Cinco Minas peak. The dacite is found only on the west side of the mountain, never on the river side. From the horizontal blocks shown, the basalt can be traced westward without interruption into

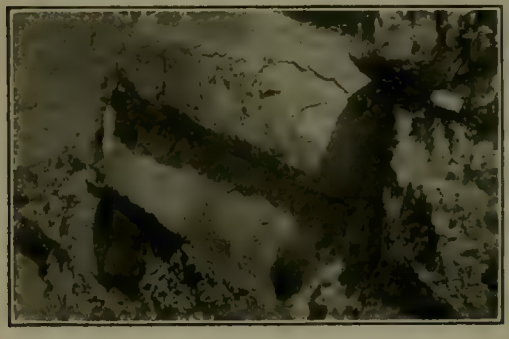


Fig. 2. Displaced Basalt Flow, Cinco Minas.

the normal vertical position, the public road running over the tops of the prisms for half a kilometre. The cooling was evidently slow, the prisms sub-dividing longitudinally into thin layers parallel to the faces, so that the exposed upturned ends are literally a mosaic of concentric figures. This basaltic rock differs in this respect from the true basalt found in the Balbaneda canyon, which is in small simple five-sided prisms without tendency toward splitting. Intermittently with the basalt flows occurred numerous flows of rhyolite and stocks of dacite, the latter of which seem to have been of prime importance in determining loci of ore deposition. Every ore deposit of economic importance which the writer has examined in the region is closely associated with such an intrusion. The genesis of the Cinco Minas ore deposits is particularly interesting. The dacite stock above referred to, forms the foot-wall of the deposit proper, the hanging wall being the andesite sheet pushed up by the intrusion. The andesite is thus presented on the surface as a narrow strip, about 500 metres wide, highly decomposed, associated on its western edge with mica-like particles with a coppery lustre. Similar rock occurs on the western edge of the Santo Domingo deposits farther north. In horizontal section, the dacite stock is about 200 metres across from southeast to northwest. The chemical affinity of the highly silicious dacite with the more alkaline andesite has been favorable to ore deposition. The resulting vein consists partly of mineralized brecciated particles of country rock surrounded by the precipitated quartz, and partly of altered hanging wall rock. The rock has been mineralized from the foot-wall outward, ending in a thick soft gouge. This seems to be typical of the veins in the district. The vein is in places over 90 ft. in thickness. At both ends of this deposit, the fracture continues in the andesite, and has been subject to the same vein-forming processes, though to less degree. Both north and south then of the original Cinco Minas ore-shoot, important deposits have been formed; both foot and hanging being andesite, generally speaking, though dacite has been observed in the hanging wall at the north end. A succession of local enrichment faults approximately at right angles to the strike has given the orebodies to the south great economic importance. In this area belongs the bonanza body taken out by former owners, as well as the continuation downward of the same, found in June of the current year. As permission to go into details has been withheld by the management, only the general features of these interesting structures can be touched upon here. In general, the evidence is strong that persistent bodies of primary ore of commercial grade were formed in the vicinity of the dacite intrusion as a result of favoring precipitation conditions; that where the fractures are wholly in the andesite, the ore, though still of commercial grade, contains a slight admixture of base sulphides; and that when so formed, local faults have in many cases given opportunity for secondary enrichment that has resulted in the formation of bonanza orebodies. That the original deposit is of primary origin seems certain. Bodies of banded primary ore, assaying high in silver and gold, have been found in the lowest workings, 1000 ft. below the outcrop. As in the rest of the mine, the most valuable ore contains silver sulphide, with a small but important and constant percentage of gold. The ore at the Casados mines near the San José is said to be similarly banded.

The Cinco Minas fracture system is easily traceable northwest along the west side of the Santiago to the vicinity of the Santo Domingo vein-system. Here parallel productive veins are known, some of which have been worked for many years. The deposits are quartz, with silver sulphide containing gold, and are thick, robust bodies, sometimes 30 ft. across normal to the dip. The conditions in the Santo Domingo area have been somewhat complicated by faulting. The veins have been intruded by a dacite stock, entering from the east like the Cinco Minas intrusion, but of more recent age. The faulted blocks, of immense size, have been moved a considerable distance to the east, after which re-cementing and later mineralization of the broken and loosened masses have formed immense irregular deposits on the river side of the hill. Developments now in progress on neighboring prospects will later afford

interesting data bearing on this question. The rhyolite stocks in general seem to antedate the andesite flows, as the latter flows on the northern slopes are of later date and to go across the veins. Such a flow in the Balbaneda area came up from south to north at about 45°, covered the Cinco Minas vein system to below the southern end of the properties and aided in forming the rugged topography of that section. The flow occurred intermittently with basalt eruptions. Upon the inclined surface of the rhyolite are found perfect cooling prisms of basalt undisturbed since the date of their deposition.

Official maps and determinations claim the existence of slate and shale [illegible] in this area. They are best shown at the mouth of the Balbaneda canyon in nearly vertical cliffs. The rock is blue-black, finely laminated, with numerous right hair-lines parallel to the lamination. It breaks and splits in a manner quite similar to shale, especially where the specimen is highly decomposed. The rock is not

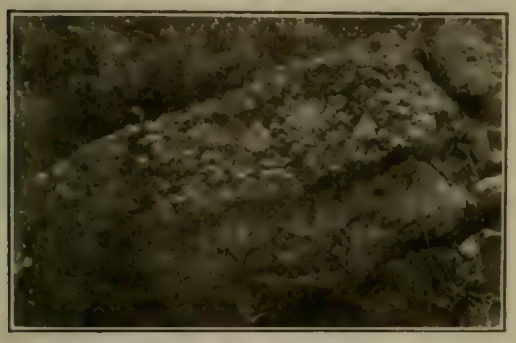


Fig. 3. Tertiary Corrals Found near Cinco Minas.

shale, however, but flow-rhyolite belonging to the sheet just mentioned. It is of great extent, reaching from the Balbaneda through and beyond the San Mattias canyon and becoming massive in the latter arroyo. Both canyons have formed following the line of this flow, succeeded by erosion of the overlying basalts. At present the Balbaneda creek flows for most of its course between precipitous walls of rhyolite on the north and of basalt on the south; at the canyon mouth later disturbance of the flow has allowed the water to cut its way through the rhyolite.

On following the cliffs into the side gorges where decomposition has not been so active, the same laminated 'shales' are found, but represented by five-sided prisms of indisputably igneous origin; and by following still farther, whole cliffs of these cooling-prisms, exactly identical with the shale-like rock, but plentifully sprinkled with large phenocrysts of feldspar, may be seen. The succession affords most satisfactory opportunities for study. In addition crystalline aggregates of obsidian in quantity are associated with the rhyolite. The only sedimentaries observed here are the small and economically unimportant conglomerate beds already mentioned, and a few still smaller limestone beds of negligible area and a few inches in thickness, near the town of Hostotipaquillo. They belong to the low-level (probably Tertiary) period when all this section was sub-

[illegible] In this general appearance for having the [illegible] and rocky ridges [illegible] in the photograph, Fig. 3. They occur in a small hill near Cinco Minas on the surface, the whole hill being made up of them. These are the only fossils observed in the district.

The close relationship of the dacite intrusions to the ore deposits of the region cannot be better shown in a way somewhat different from the conditions prevailing at Cinco Minas than at a mine nearby. The original rich deposits here were entirely in the andesite, and were stoped to considerable depth over an unusual length. Recent exploratory work at depth below these workings has shown that this important deposit was not merely a cooling-crack in the andesite flow, but that like the others of importance, it is genetically related to a dacite intrusion. The latter, coming up from below as a stock, fractured the andesite sheet and was itself fractured. Mineral-bearing solutions circulating in the openings since the disturbance have formed a vein, low in metallic content in the dacite, rich in gold and silver in the andesite. The difference in alkalinity was evidently the determining factor in precipitation.

The recent age of the deposits in the vicinity is interestingly shown by the fact that at the bottom of the lowest working in one mine I found a piece of practically unaltered basalt, as part of the vein-filling of country-rock breccia. Thanks are due the management of Cinco Minas for permission to publish the notes regarding the general geological features of these deposits.

ONTARIO OUTPUT, JANUARY-JULY

Returns to the Bureau of Mines of Ontario show that the output of the metalliferous mines and works for the six months ended June 30, was as follows:

	Quantity.	Value.
Silver, oz.	12,804,992	$6,260,197
*Cobalt, tons	189	35,657
Copper, tons	4,634	660,497
Nickel, tons	9,339	2,005,660
Iron ore, tons.	39,497	113,082
Pig iron, tons.	221,718	3,540,688
Zinc ore, tons.	576	5,000

*Only cobalt paid for included.

Shipments from silver mines aggregated 14,787 tons, of which 12,024 were ore and 2763 concentrate. The former averaged 814 oz. of silver per ton and the latter 1017 oz. Gowganda contributed 334 tons of ore containing 317,925 oz. of silver, and the Lake Superior district a small production, the remainder being from Cobalt proper. The production for the corresponding period of 1909 was 11,234,382 oz. of silver valued at $5,379,980. The nickel-copper mines of Sudbury turned out 9339 tons of nickel and 4634 tons of copper, as compared with 6027 of the former and 3741 of the latter for the same period last year, an increase of 52 and 42%, respectively. The production of pig iron as compared with the first six months of last year does not show a very large increase, the figures being 221,718 tons, having a value of $3,540,688, as against 211,583, valued at $3,197,759 in 1909.

Development and Operation of the Mining Law of New Zealand

By A. C. Veach

*New Zealand was formally made a portion of the British Empire in 1840, and in the same year the settlements at Wellington and Auckland were established. This colony was thus founded at a time when those in control of the colonial office in London were not in favor of reserving in deeds of grant any minerals, and this policy has been followed to this day. While it was separated in 1841 from New South Wales, of which it was initially made a dependency, the land laws and regulations in force in that State, including the imperial lands sale act of 1842, continued in force until 1846, when a new charter was issued. In the instructions under the first charter it was provided that (1) lands should be separated into "such as are supposed and such as are not supposed to contain valuable minerals;" (2) that mineral lands might be sold at auction, after due notice, at any price exceeding the minimum fixed for ordinary lands; and (3) that any land supposed to contain minerals might be leased for any term of years not exceeding 21 at a royalty of 15%. This sounded the keynote of the mineral-land policy that has been followed by New Zealand to this day. The administration has always endeavored to separate mineral from non-mineral lands, and the laws have always authorized the sale and leasing of such lands. The royalty was reduced in 1848 to one-fifteenth, and in 1850 the first separate mineral lease regulations were issued. New Zealand was, under the charter of 1846, divided into two provinces—each with its own lieutenant-governor and assembly, composed of a legislative council and a house of representatives. All the North Island, except a small area about Wellington, was included in the province of New Ulster, and all the remainder in the province of New Munster; the cities, Auckland and Wellington, were naturally the seats of government of the two provinces; in addition there was a general assembly for the whole colony. The mineral regulations of 1850, although appearing in the *New Ulster Gazette*, were apparently applicable to the whole colony, and while a waste lands occupation act was passed in 1849 for the province of New Ulster, the land regulations were generally the same for the whole colony.

At this time coal and copper were known in several parts of the colony. A copper mine had been opened on Kawau island on freehold land, acquired in the period previous to 1847, when no distinction was made between mineral and non-mineral lands, and a coal mine, which, like the Kawau mine, never proved of any value, had been opened at Nelson as early at 1842. How soon government leases were issued under the instruction and regulations cannot be determined, as most of the early government records were lost when the capitol was transferred from Auckland to Wellington. It appears, however, that leases were issued in 1852 for coal and copper in the vicinity of Nelson, presumably under the 1850 regulations. In the same year alluvial gold was discovered near Coromandel Harbor, and provisional regulations were at once issued. These, like the first Victorian and New South Wales regulations, related only to the digging of alluvial gold, and fixed the same fee of 30s. per month. The lands involved were native lands and were entered under special agreement with the natives: the government, in addition to paying a fixed sum to the natives, based on the number of miners, agreed to give the natives 2s. from the amount received for each miner's license. This goldfield did not prove of much importance and was for a time abandoned; the necessity for special gold mining laws, therefore, did not arise until some years later. Gold was found in Nelson in 1857, in sufficient quantities to cause some excitement, and as the field showed some evidence of permanency there resulted the goldfield act of 1858. This was largely based, as were succeeding goldfield enactments, on the Victorian statutes. However, it was not until 1861 that finds of sufficient importance to attract more than local attention were made. In that year large discoveries were made in Otago, and the first gold rush which affected people beyond the colony begun. In 1861 $3,750,000 worth of gold was produced in the field, and this rose to $7,500,000 the succeeding year, and to almost $12,000,000 in 1863. The excitement here had hardly begun to subside when considerable finds were made in Marlborough, and in 1865 the famous West Coast goldfields were discovered. About this time rich lodes were found in the Coromandel fields and the importance of New Zealand as a gold-producing region firmly established. At first the work was conducted wholly on the basis of miners' rights and claims, but in October, 1859, an application was made for a gold mining lease in Nelson, and in 1860 numerous applications were filed. As the early period of alluvial digging passed, more and more developments were undertaken on leases and the miners' right claim was gradually restricted until today only alluvial ground can be held under this form of tenure: all reef or lode development must be undertaken under license or lease.

In 1859 the coalfield near the Clutha river, in Otago, was reserved and mining leases issued. In 1862 reserves were made in Nelson covering the high-grade bituminous coals of that region. Coal leases were at once issued and the development of this, the most important coalfield in the colony, was begun. Coal was not exported in any quantities until 1867. Mines have been opened gradually in many parts of the State, but except in the West Coast coalfield the coal is of a sub-bituminous or lignitic character. The developments of minerals other than gold and coal have thus far not proved of much importance, with the exception of the fossil resin, Kauri gum. This substance was first dug in 1853, and the total production to December 31, 1906, had a value of £13,443,017.

*Abstract from 'Report on Mining Laws of Australia and New Zealand,' Government Printer, Washington, 1910.

The mining law for coal and minerals other than gold was for many years interwoven with the land regulations of the provinces. Under the constitution act of 1852 New Zealand was in 1853 divided into six provinces, the two old provinces of New Munster and New Ulster were abolished and the new provinces were named Auckland, New Plymouth, Wellington, Nelson, Canterbury, and Otago. This number was afterward increased to 10 by the formation of the provinces of Hawkes Bay, Marlborough, Southland, and Westland and the province of New Plymouth was reorganized and renamed Taranaki. Each of these provinces had a superintendent and a provincial council, and there was a governor and general assembly for the whole colony. Each province had its own land laws, and the administration of these laws rested wholly with the local officials. Although these provinces were abolished in 1875 and a central land office created in 1877, the local administration by land boards has continued to this day, and until 1892 separate provisions were made under the lands act for several of the old provincial areas which had been renamed land districts. In 1892 the lands acts were made uniform for the whole colony. The local land boards are still, for the most part, charged with the classification of the lands, in this they are assisted by a trained permanent corps of land surveyors, appointed only after rigid examinations. This force is under one surveyor-general, who is a highly trained officer, comparable to the head of the U. S. Coast and Geodetic Survey. The New Zealand land office is strong where the American is weakest.

It may be noted in passing that the striking retention of the mineral lands, which has characterized the history of this colony has been effected not by a single department but (for almost twenty-five years, or during the time of the provincial administration), by 10 entirely independent bodies. That they all adopted the same policy but adds to the impressive character of the results and clearly indicates a strong and general public feeling. All this happened long before any Labor or Progressive party was even thought of in New Zealand, and the matter is to be regarded not as a socialistic propaganda but as a simple business judgment. There was throughout this period always the provision for sale, and that practically no known mineral land was sold is clearly a most convincing indorsement of the success and practicability of government mineral leasehold. Had it been found desirable or necessary to sell the freehold of mines in order to promote mining industry and the general welfare of the region there can be no question but that the minerals would have been sold.

In some cases these provincial regulations also touched gold mining. In several of the early goldfields acts no rental was fixed, and this rental was determined in each province. The Nelson wastelands act of 1863 provided that gold leases should be issued at a rental of 10% of the value of the land involved, but that no land should be valued at less than £10 per acre. It further provided that "before a lease is granted the land may be offered for sale at public auction at the upset price at which the land is charged. This is the only specific provision which has ever been made in New Zealand for the sale of known auriferous lands.

Although a general mining act was passed in 1871, provisions regarding mineral leases continued to be incorporated in the lands acts for several years. Special acts were from time to time passed with reference to certain coalfields, and in 1886 the coal mining law was entirely separated from the other mining law. Scarcely a session of parliament has passed without the enactment of an amending mining bill, so that taken all in all the number of acts which have been passed in New Zealand containing provisions regarding mining is very large. The existing law as to minerals other than coal and kauri gum is found in the mining act of 1905.

The result of the test of government mineral leasehold in New Zealand affords a most conclusive demonstration of the soundness, practicability, and economic value of this form of tenure. For sixty years this State has provided for the sale and leasing of mineral lands, and yet practically no known mineral lands have been sold—all have been leased. For forty-two years in one part of the State or another the lands comprised in mineral leases could be put up for sale at public auction at the request of the lessee after three years' development work, and for seventeen years the lessee could demand such a sale as a right, and yet an entirely negligible quantity of land was sold in this way. This result has been attained not by arbitrary or despotic means but in a freedom-loving English-speaking country, a country which within the past year has conclusively demonstrated that it cared not for abstract doctrines, but only for results. It cannot be considered as the result of any socialistic or labor agitation, for during the first forty-four years the dominant political party was the Conservative; only in 1891 did the Progressive and Labor Party become of importance, and it has done little more in connection with the mining law than continue the principles already established. Had the policy of mineral leasehold not proved entirely satisfactory, the sale of mineral lands would undoubtedly have resulted, as is conclusively shown by the action of the State in regard to perpetual agricultural leases. One of the early acts of the Progressive or Labor Party was to provide for a 999-year lease for agricultural holdings. This was in response to the cry for the non-alienation of land, but in providing for this form of tenure the settler was allowed to select between it and freehold. Under these conditions more land was taken up under perpetual lease than under forms of disposal leading to freehold, and the advocates of this plan rejoiced. However, after a time the holders of perpetual leases desired the freehold, and as a result of their demands a law was passed the last session of Parliament abolishing 999-year leases and permitting the holders of such leases to convert to freehold. Not only is there now no demand for the freehold of minerals, but the mining men are practically a unit in regard to government leasehold as better for mining industry than freehold.

Summer Travel in Mexico

By J. A. MacDonald

I have just been discussing mining affairs in Mexico with a young engineer who was there last summer, and he concluded by saying that he would not go there again in the rainy season for the best mine in the Republic. The sun glared on him, the rain wet him, the mosquitoes bit him, the natives would not speak English to him, he did not like the way they fed him, he could not find a mine, and it was all very distressful. I think it is all a matter of temperament. It is very doubtful if that man will ever find a mine, make a mine, or operate one successfully. It is true there are some vicissitudes there in the rainy season, but compared with the blasts and blizzards we often have to endure in the northern hills, a trip there would seem to me a veritable honeymoon. Nine winters ago, some four or five thousand men went up to Thunder Mountain, Idaho, through the deep snows of that country, with packs on their backs, and not one made a valuable discovery. Many left their bones in the wilderness. I never saw so many sick men outside of a hospital as were scattered along that trail. I believe the wood-ticks that infested the trees and brush caused much of the sickness, apart from the hardship and exposure. Notwithstanding all this the most of them would immediately start out again under the same incentive. Among mining men 'the lust for gold' is not so strong as is the joy of conquest, the spirit of adventure; the spirit that scorns all danger, all obstacles to attain an end. To those who have not traveled over the mountains of Mexico in the summer season, some details of such a journey may prove interesting, possibly of some value.

Part of Northwestern Mexico.

I took with me a folding cot, blankets, shelter tent, mosquito netting, oilskin jacket and pants, and a little box of medicines, containing quinine, seidlitz powders, ammonia, permanganate of potassium, carbolic acid, borax, vasaline, witchhazel, and some ipecac, which is a specific for dysentary in hot climates. There also was a package of indigo for snake bite. I had room for a blow-pipe outfit in the same box. Of the medicines, I only had occasion to use the ammonia and permanganate, for the bites and stings of insects, and once I found the carbolic acid effectual when the other drugs failed. I was able to alleviate many ills among the natives with these simple remedies. The people have knowledge of many valuable roots and herbs in their own country, but are usually too improvident and indifferent to gather them before they are needed—that is part of 'the white man's burden.' There is an Indian in the Fuerte valley who has a remedy for hydrophobia that has never failed in any case he has been called on to treat. That terrible disease is prevalent there, originating with the small pole-cat and being communicated to the coyotes and other animals. Because of some superstition this Indian will not disclose his remedy.

Last summer I had to examine a property in the southwestern part of Chihuahua, in the District of Chinipas. I took the evening train from Los Angeles and arrived at San Blas Junction, Sinaloa, after a ride of 49 hours. There was nothing to mar the pleasure of the journey, though it was very hot going through Yuma; hotter than in Los Angeles. They said the thermometer registered 118° in the shade the day previous, "but then it was dry heat" and they did not mind it much. If they ever get a wet heat! I remained at San Blas over night and took the 11 o'clock train the next morning for Fuerte, on the K. C. M. & O. railroad. The station at Fuerte is five miles from the town. Some of the land-holders there were extravagant in their demands of the railroad company. Hence this gap.

Fuerte is a picturesque little town of some 5000 inhabitants, situated on the river of the same name. There are three good hotels that furnish bed and board for ₱2. I stopped at the Cosmopolita, where I met some old friends. The next day I secured two mules; one to ride and the other to pack my bedding and grip to Choix, as it is more convenient to outfit there for a journey into the mountains. The distance is 45 miles over a good wagon-road. I paid ₱7 for the use of the mules and for a boy to bring them back.

We left town at 4 o'clock in the afternoon to avoid the heat of the day. About two hours after, a violent thunder storm came up. I put on my oilskin suit and let it pelt away. The lightning flashed and quivered around and above us, and at every crash of thunder overhead it seemed another cloudburst. It was a furious war of the elements, but it surely made the corn rejoice. We jogged along till we came to Aguajito, a small pueblo about 25 miles from Fuerte. Here we stopped for a few hours' rest. The family was sleeping on the porch. Don Luis, the master of the house, insisted on my taking his bed, though I had my own. He never saw me before or after, and that act of courtesy was characteristic of those people wherever I went. He prob-

ably swept at a point the remainder of the night. We slept some four hours, it seemed, then awoke and were off again at the earliest daybreak. We arrived at Choix at 8 o'clock, in time for breakfast. Choix is a small town of about 1,000 inhabitants and situated on the west bank of the Choix river. Here, as at Fuerte, the water for domestic use is brought to the house in leather sacks, swung on the backs of burros. The sacks are filled by driving the burro far enough into the river to fill the sack. A plug is withdrawn from a hole in the bottom and the water allowed to flow in. The country hereabout is chiefly underlain by granite showing considerable feldspar. There are low hills at intervals. Low-grade placers have been worked to some extent by the natives along the Choix river. None of them, I believe, can be considered worthy of attention. I could not learn of any mine south of the Fuerte river that was being worked at a profit. East of the Choix there is a range of mountains with mineral veins that may prove valuable. Twelve miles east is a large deposit of low grade copper ore, in a rhyolite dike close to the river. It is estimated that six million tons of ore are exposed. The ore consists of oxides and carbonates of iron and copper, with a little gold. It is called the Mozamique mine and is owned by Americans. Some time ago I found rich gold quartz near the head of the Choix river, but never have had time to seek its source. At Choix, Vega & Sons have a complete assortment of goods for the home, camp, or mine. I purchased a cooking outfit and supplies from them at prices but little higher than at Nogales. As it is not expedient to purchase mules for a short trip, I engaged three at the rate of ₱1 per day, and a mozo or guide at the same rate. Good mules accustomed to the mountain trails can be bought for from $50 to $75.

In traveling through the mountains in this country the mozo is almost a necessity. Using ordinary precaution in securing them, one will find them to be loyal and extremely honest. They are expert packers, know the best trails and fords, the best places to camp, and where the best pasturage may be found on the road. While you ride they trot along on foot behind, tireless, silent, and vigilant; every now and then tightening up or adjusting the pack or chasing the vagrant mule back to the trail from which he has wandered. When evening comes they care for the animals and make themselves generally useful.

Making a late start the first day I stopped at Nacimiento, some fifteen miles from Choix and camped at the home of Jose Barfuson, an old German, 'the Sage of Nacimiento.' He has been in Mexico since the Civil War in the United States, having fought under General Grant. He is full of reminiscences. I spent a pleasant evening under his hospitable roof and got away early the next morning, reaching the raging Fuerte about noon. The water was about ten feet higher than normal. We hailed the boatmen at the ferry near the mouth of La Reforma canyon; they came over with a good sized boat, into which we loaded our outfit. Having stripped the mules, we led them astern with ropes, and [illegible] We crossed to safety. I would not attempt it again while the river was so high. It would have been more prudent to wait a day or two and not run the risk of losing the mules. The river sometimes rises thirty feet above low water mark. It is destined to furnish great water power and to supply water to irrigate a large territory. After a light lunch we entered La Reforma canyon. We were in a great mineral region, one to delight the eye and sense of the miner. The mountains rise in rugged grandeur each side of the narrow chasm to a height of two or three thousand feet. At this season a stream fifteen or twenty feet wide and a foot deep flows down the canyon. We noticed the masses of igneous rocks, covering the granite base, and reaching the tops of the highest peaks. Far up where the slope of the mountain will permit, patches of cultivated ground may be seen. Along the margin of the stream many *hogueras*, a species of fig tree, grow luxuriantly. They resemble a cottonwood. My mozo said that they produce a fruit which is palatable and nourishing. Occasionally we saw a *guajilote* tree all abloom with big purple flowers, something like those of the oleander in form and color. Where the soil is favorable fine specimens of the sycamore grow, and always the thorny cactus and mesquite. It is remarkable the number of trees that have thorns in this country, even on their trunks. No doubt it is a wise provision of Nature for their protection. If man would take the hint and prevent forest fires it would accrue to his advantage.

The trail follows the bottom of the canyon, and when that becomes too rough it climbs the sides of the hills. Two slender waterfalls descend the east side of the chasm from a great height. The water is pure and refreshing. The water below is poisonous in the dry season when the flow is scanty, being heavily impregnated with copper from the veins and mines in the district. There is a copper mine at the head of the canyon, called the Bahueracic, that was worked extensively during the French occupation. It might be profitable to use a precipitant here for the copper. Many veins crop out on either side of the arroyo, and at least one showed a good percentage of copper. It was about six feet wide and was heavy with bornite. The pay-streak occupied about one-third the width of the vein, and the bornite lay in bands and convolutions where the stream had stripped it bare. Far up on the mountain I could see old workings on what appeared to be the same vein. I could learn nothing of its history except that it was open to denouncement. There are squatters occupying every available spot along the arroyo where a bit of ground can be cultivated.

About 4 o'clock we reached the home of the Garcia family, where I am acquainted. The grandmother is a fine old lady with the dignity and mien you might imagine graced the mother of a Diaz or Cortez. The next morning we took the trail leaving the noted Lluvia de Oro mine a few miles to the southeast. For centuries that great deposit lay neglected, staring out from the face of a limestone cliff, while Mexican and Spaniard passed and repassed it un-

heeding. The Indians knew its merit, but kept the secret well, till one of them in a drunken orgy babbled about it, not knowing that Espiridion, a Mexican, listening, knew his tongue. It came into the possession of Americans. At first under the capable management of Mr. Underwood, who was ably assisted by Tom Smith, it became a famous producer. They shipped ore from this mine that ran 60 oz. in gold and 1100 oz. in silver per ton. Later, under various managements, it has had a checkered career, but like a good man it cannot be kept down. I learn that now they have a competent engineer in charge. It has been the scandal of two nations.

I have reason to believe that a number of good veins will be found within a radius of six miles of this property. There is a 'lost mine' in this vicinity, called the 'Gloria Pan.' They have the records of it in the archives of the City of Mexico. There is the Gloria Pan mountain and Gloria Pan pass, named after it, while on the hillside remains the slag pile from the ancient furnace where the ore was treated; but the mine itself cannot be found. The Indians know where it is, but will not tell. A good prospector would probably find it in a few weeks' search.

Toward the head of the canyon we reached a point called Tule, from which we took an arroyo to the east that brought us to the little camp called San Francisco. Here I met my friend, Jim Paul, who was to guide me to the property I had to examine. One of the animals I engaged was unfit for the journey farther, and I sent it back to the owner. Jim had a good saddle mule and a pack-horse, and with them we made an early start the next day. Climbing up a steep trail we reached a point that commands a magnificent view; the freshness and glory of a beautiful morning were on the hills. To the horizon on all sides, undulated one vast sea of corrugated stone. Only in the 'Great San Juan' or in the wilds of Idaho have I seen such evidence of the mighty forces of Nature. These scenes never pall on the senses of the mountaineer, whatever may be his fatigues or difficulties.

We followed the trail along sharp ridges, down through steep gorges, across streams and up again, over rough trails and smooth trails, sometimes so bad we had to stop and make repairs. The sure-footed little mules picked their steps with rare sagacity. The air was fragrant with the perfume of many flowers. The mocking-bird and his cousin, the *cuitacoche*, more musical, charmed the ear with their melody. The parrots in flocks chattered about us; occasionally the *cuiche*, a fine game bird, started up from some shady dell as we passed. This bird crossed with the domestic fowl makes a great fighter; the ordinary game-cock has no show with him, as he fights in the air. At intervals by the wayside we noted a lonely grave marked by a cross and a cairn of stones. The wandering Scot may here recall a feature of his native hills.

About noon we passed through Becerra's ranch at Huachara, where there are some hot springs. There is considerable limestone seamed with veins in this district, but as we were pressed for time we could only look at it with longing eyes. We got some grain for the animals at the ranch house and pushed on to a vacant cheese factory, where we camped for the night. It rained heavily as we neared this point, but we managed to start a fire and cook supper under shelter. About dark Jim was stung by a scorpion on the finger as he came through the fence of the corral. The fiery lance of the little demon burned like a red-hot iron. I applied some ammonia, which relieved the pain, but his finger remained numb for several weeks. We were tormented with 'jiggers' which cover the wet leaves at this season. They make their way through the clothing, and even through shoes, burrowing into the flesh and causing intense itching. We did not mind them much during the day while we were occupied, but at night when we got between the blankets the annoyance became intolerable. We bathed from head to foot with a solution of permanganate, which soothed us to sleep and proved an efficient antidote. Later I found coal-oil would answer the purpose quite as well. The jigger dies in about twenty-four hours without any application—but he dies hard.

Our course the next morning was nearly due north; the trail was somewhat obscure at first, but Jim soon found it, and we went on at a good rate till we came to a sharp declivity where Jim's pack-horse lost his footing, fell down the mountain over the jagged rocks, and was killed. We put the pack on one of the saddle mules and took turns riding after that. We reached the Cayereche river that evening. The water was so high we could not cross, so we camped at the house of an Indian near the ford for a couple of days. He had a little boy not old enough to talk, yet he could sing, and kept up a chant much of the time. The little fellow was very interesting. These people are of a happy temperament, but the poor women always seemed to me to have a look of inexpressible sadness in the depths of their eyes that is pathetic. The men seem to treat them with kindness, but their life is one of hopeless drudgery from early dawn to close of day, and the natural cheerfulness of their disposition is blighted by the most abject poverty.

We employed our time here in prospecting, but without finding anything that appealed to us. The appearances are much better on the other side of the river, where there are some big dikes decomposed and heavily stained with iron. When we finally crossed over we tested some of them near the trail and got fine colors of gold, but nothing that looked like pay. In two days' travel from this point we arrived at the property I came to examine. I got the necessary data and took samples which I had assayed at the laboratory of the La Plata mine, known locally as the Santa Barbara mine. Mr. Walton, the metallurgist in charge at the mill, showed us every courtesy. They have a good plant of machinery here, adapted to concentration and cyanidation. Power is developed from the Septentrion river, which crosses the vein worked. The lower adit was driven in 900 ft. on the vein without a break in the ore. The pay-streak varies from 12 in. to 12 ft. in width and the face of the adit was still in ore at a depth of 800 ft. below the surface.

The average value of the ore is said to be about $100 per ton, mostly silver. Crispino Guerra the Mexican who found the mine never realized a dollar from it. He was too poor to denounce it and those to whom he showed it proved ungrateful. I was told it was purchased by the present owners under a bond for $750 000. Guerra is now herding goats in the neighborhood.

I saw some good looking prospects in that district. Some of them showed ruby silver, but silver sulphide and chloride prevailed. A few miles down the river from where we camped, I noticed that the formation was greatly disturbed. I went to investigate, and found evidence of an old crater, about one-fourth of which remained, the rest of it had been eroded and had tumbled into the stream below. About 100 ft. north of the rim, running at a tangent, there was a good vein with a six inch streak of quartz that yielded $7.25 in gold per ton. There is an abundance of game hereabout, deer, turkey, wild hogs, and flocks of wild ducks on the river. Much as I would have liked to remain in the country, circumstances made it imperative for me to return without delay, so bidding farewell to the many pleasant acquaintances we had made, Americans and Mexicans, we started homeward. Our return was but a repetition of our journey inward.

During all our travels we only saw three snakes, one of which we got near enough to kill. We also killed a huge gila monster. They seem to grow much larger here than in Arizona. The mosquitoes and jiggers gave us the most annoyance. Whenever we left the trails our progress was slow and difficult, as the tangle of vines and underbrush grows exceedingly dense. I carried a pedometer and found we could only make about a mile an hour, and even then, when not wet with rain or dew, we were bathed in perspiration. In the winter season it is entirely different and much more agreeable, besides, a better view of the surface can be obtained.

I have often wished when going through some great mining camp like Butte or Cripple Creek, that I might once get into a mineral region that was not plastered over with locations, and here in the Sierras of Mexico was the first time such an opportunity came to me. I knew a reliable man who in a journey of two months made four valuable discoveries, and had little time to prospect. For a hundred miles or more, north of the Fuerte river, approximating the course of the 'Stillwell' railroad (K. C. M. & O.) is a great mineral zone, where the conditions seem ideal for good mines. Andesite is the prevailing rock of the country, and this is intruded by dikes of rhyolite, diorite, basalt, and other igneous rocks, with limestone at intervals. Granite appears rarely. The rocks are faulted, folded, fissured, and traversed by many veins. There is much decomposition and chemical action evident. The erosion has been great and the deep gorges with bare walls afford easy prospecting to the practised eye. The laboratory of Nature has been prolific in the distribution of her treasures in these mountains, both as to quantity and quality. Nearly every metal as well as gems and precious stones are found scattered through these hills. Coal and oil are abundant, though but slightly developed. Of iron there is scarcely a limit. In Sinaloa there are many fine tracts of timber and not a saw mill in the State. Owing to certain wind currents the time of the rainy season is the reverse of that in California. From June till October the rain falls at uncertain intervals, not always when it will do the most good. In the northern States there is no sure crop without irrigation. In the mountains there is little ground available for cultivation. The slopes are so steep and the gorges so narrow that only rare spots can be tilled, and these are fully utilized. It is essentially a mining country, and as such it has no rival. Its resources are infinite.

These notes on agricultural conditions only refer to certain portions of the Republic. In some of the southern States from 80 to 160 inches of rain falls annually, in that section all tropical vegetation flourishes. In the north and northwest States there is a scarcity of food much of the time and many of the people are in a state of destitution. Whatever their condition may be they are always kindly, courteous, and amiable in a rare degree. Too often they are improvident, shiftless, and lacking in application—prone to emulate the lily of the field that toils not—but withal they are exceedingly human. I speak of these traits because some who deal with them are unable to modify the standard of action to which they are accustomed in Boston or Oklahoma. Under the wise and beneficent rule of the present government the Mexicans are making rapid progress. Education is compulsory and eagerly sought in the cities and villages of any size. In remote districts schools are not yet possible, but in due time these will be reached. Nearly one-sixth of the population speak the Indian tongue only, but order prevails among them. There has been a great deal written about tyranny and arbitrary rule down there and there may be instances of it. I have discussed political matters with Mexican citizens and officials and they were as free to criticize their government as any radical here in the States. More than that, I know an official who went down to the City of Mexico to remonstrate with the President himself about an election that recently took place. He came back smiling and not in the least disfigured. There are only two rulers on earth anyway who are pre-eminent, and Diaz is one of them. The laws are generally just and no more selfish than our own. In some cases they are more liberal. The intelligent foreigner who goes there will adapt himself to his environment. If he is unreasonable and critical he will have plenty of grief and had better stay at home. Wise statesmen of all nations do well to encourage foreigners who can add to the prosperity of their country. They soon become as good citizens as any, and this is recognized in Mexico.

In these brief notes I have referred to a narrow strip of country, a mere thread in a web. There are two great ranges coursing southeast for nearly two thousand miles, besides the isolated peaks that are highly mineralized and much of this territory has never been prospected.

Discussion

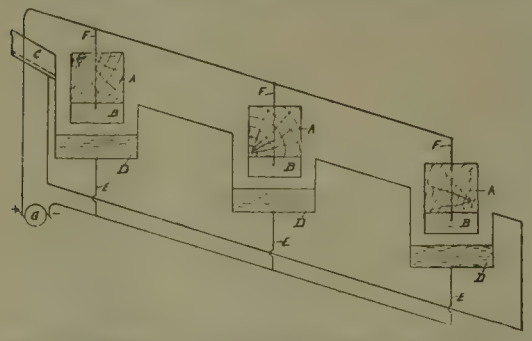
Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

A Cyanide Problem

The Editor:

Sir—In your issue of August 13 appears a communication signed 'Mine Owner,' from Tucson, Arizone, in which reference is made to quartz gangue, abounding in pyrite, with small amounts of galena, blende, and chalcopyrite, the value being chiefly in gold, which may be panned; the further statement follows that after amalgamation and cyanidation the tailing was of about one-half the value of the head; your correspondent states that silver is also present in a complex antimonial compound, and attributes the low extraction to the presence of antimony, and desires to know if there is any remedy besides roasting.

I would suggest that a remedy may be found in the use of the electrolytic sodium-mercury cell for



Three electrolytic sodium-mercury cells, forming a portion of electrolytic amalgamating sluice; longitudinal sectional view. A, baffles for deflecting gangue on mercury surface; B, graphite electrode (anode); F, positive connection with generator, G; D, mercury connected as cathode with negative lead, E; C, launder delivering pulp, water, and salt solution.

amalgamation in which a series of mercury cells or riffles (Hungarian mercury wells) are arranged in the form of an electrolytic amalgamating sluice, the mercury being excited by a low voltage current (five to ten volts) of high amperage (twenty to thirty amperes per square foot of mercury surface). When such a device is adjusted to the existing conditions, it has been found that all gold and silver in a metallic state not encased readily amalgamates. Pulp and slime are simply passed over the device and the metals are automatically extracted in the form of amalgam. The construction of the apparatus prevents any blanketing of the mercury and fouling or flouring is impossible. To obtain these results in the electrolytic mercury cell a definite amount of salt solution is fed into the water passing over the sluice; sodium amalgam is formed and any required strength is constantly and automatically maintained. The construction of the mercury sluice is illustrated in the accompanying design, which represents a longitudinal section of three cells. In such a device, properly constructed and adjusted, all free gold and silver, regardless of the presence of sulphur, arsenic, copper, antimony, or other refractory elements, will readily amalgamate while the gangue is passing over three or four lineal feet of excited mercury surface; such a device has a capacity three times as great as a mill plate of the same width.

To determine the amount of free metal in ore at any given mesh, assay a sample; then treat a similar sample with strong sodium amalgam. The sodium amalgam should be strong enough to amalgamate copper wire instantly. After agitating for twenty minutes carefully draw off the water, pulp, and slime, evaporate and again assay; the difference between these assays shows the free gold present, which may be extracted by a series of electrolytic cells. As only a low voltage current is needed for the electric amalgamator, the cost of operating such a device is trifling; a five horse-power generator will furnish current to treat the product of a 40-stamp mill. I might add that these statements are based on the results of scores of demonstrations, and there is ample evidence that the electrolytic sodium-mercury cell will extract all released gold regardless of the physical or chemical conditions of the gold or associated elements. The basic patents on electrolytic amalgamation have all expired.

ELMER ELLSWORTH CAREY.

San Jose, California, August 16.

The Weight of Learning

The Editor:

Sir—The worst offender among manufacturers of cumbrous books has been discovered and I take pleasure in holding IT up to public contumely. As it is a bureau, and as it has reformed to a degree, I feel sure that it will not be offended.

In 1894 and again in 1904 the Bureau of American Republics issued a valuable publication in two volumes, entitled 'Commercial Nomenclature.' The books contain parallel columns of English, Spanish, and Portuguese names of commodities "upon which duties are levied." As duties are levied, in one American republic or another, upon practically everything portable, the list may be said to be complete. Over 50,000 names of things are listed, including everything from absinthe to zoötic (hydrocyanic) acid. Every engineer who comes in contact with Latin-Americans and Americans will find it useful. But the desk can be used for nothing else if even one of the volumes is in use! Why should each book have been made 12 by 15 by 2 in. with a combined weight of 18 pounds and some ounces? The pica type is clear, but such large type is not required or even desirable in a book of reference. The board bindings are heavy. Each page is provided with a blank space 7 by 3.5 in. solely for the use of the reader for 'remarks'! This total 'remarkable' area exceeds **250 square feet** of useless white paper. A careful comparison of these volumes with Kent's 'Mechanical Engineers' Pocket-Book' shows that the text in the two could be accommodated comfortably in a volume of the size of the latter, if similar paper and type were used. The cost of manufacture would

not be much greater when the work would be made available for a general use. [illegible]

The edition of [illegible] is [illegible] 5 lb. 10 oz., a reduction of [illegible] the weight of the first edition. That is a good start, for the next edition should weigh only one-quarter of the present edition, or 1½ oz., the weight of Kent's book. Besides the book contains the English words in the first edition, are two other books to make the complete set containing the Spanish and the Portuguese first respectively. The [illegible] serve a place on the shelf of any one who has to do with buying or selling between the American Republics, but when taken from the shelf must be sent by freight.

MARK R. LAMB.

Milwaukee, Wisconsin, August 20.

A Johannesburg Landmark

The Editor:

Sir—I send you with this a correct view of the 'Corner House,' at Johannesburg, in the course of construction. The picture printed in your issue of July 23, by some means, was reversed. The building was on one of the landmarks of the city when

'Corner House' Central Administration Bdg , Johannesburg.

erected in 1904. Since then a number of large structures, the Stock Exchange, Carlton Hotel, and Barnato Bros.' building in particular, have been erected. The intimate relations of the 'Corner House' to the mining industry will perhaps warrant publication of this picture.

W. ST. J. MILLER.

Black Warrior, Arizona, July 28.

Standardization of English

The Editor:

Sir—It is refreshing to read an article like that of Mr. Rickard's, 'Standardization of English in Technical Literature,' in your issue of August 20. Engineers, both mining and metallurgical, are apt to become careless in their technical writing. "Remember the Reader" is the true 'key-note' of all literature, and should be especially so of all technical writing. Mr. Rickard objects to the use of colloquial words and local terms. I am obliged to accuse him of this error. We all know that Mr. Rick-

[illegible] that sturdy stock we grow in Cornwall and the world has not produced [illegible] the quarter of a league cornish. [illegible] with the [illegible] Comes [illegible] Mr. Rickard [illegible] be Oxon. Thus we [illegible] While I shall not dispute the [illegible] of the word **be** a contraction [illegible] that it is decidedly colloquial and local. Neither can Mr. Rickard hide behind the [illegible] of the discussion between Napier and Mercator.

I think this should not **be**, really it must not **be**, and I sincerely hope will not cause any **be(e)s**.

C. O'BRIEN.

San Francisco, August 24.

Poetry and Metallurgy

The Editor:

Sir—Your Fiftieth Anniversary Number was most readable. In connection with that poem entitled 'Malgamatin' it may interest your readers to know that it was written one lunch hour by D. Doolette, then gaining experience in the sulphide mill of the Great Boulder mine here. It is very true, as all dry-crushing and roasting men know of such troubles. Another bit of verse, entitled 'The Love Song of the Metallurgist,' and written by Mr. Vesey, appeared in the *Sydney Bulletin* a few weeks ago. It refers in the main to Broken Hill. I quote one stanza:

"Oh, come where the cyanides silently flow,
And the carbonates droop o'er the sulphides below;
Where the rays of potassium lie white on the hill,
And the song of the silicate never is still.
Come, oh come!
And partake of some
Peroxide of soda and urani-um.

While alcohol's liquid at 30 degrees,
And no chemical change can affect manganese;
While alkalis flourish and acids are free,
My heart shall be constant, sweet chloride, to thee.
Yes to thee—
Chloride-dum-dee-
Zinc, borax and bismuth and HO + C."

METALLURGIST.

Kalgoorlie, Western Australia, July 23.

Calculating Niter in Crucible Charges

The Editor:

Sir—In an article, 'Analytic Work at Copper Queen Smelter,' appearing in your publication of July 30, page 147, a method for calculating niter in the crucible assay is discussed. It is that given in text-books and most published niter charges. In its condensed form $\frac{5W - 20}{4.5} = X$ gm. of niter, where W equals the weight of lead reduced in the preliminary fusion. Why do we never see in print and seldom used this expression in its simplified form, $\frac{W - 4}{0.9} = X$ gm. of niter? The result is the same.

E. J. HALL.

New York City, August 8.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

A convenient size for specimens to be studied by the aid of a hand lens is 4 by 2½ by 1½ inches.

Hydraulic strippers have been brought into use by a number of quarries where the overburden is now being removed.

Diamond-drills are often used to determine the nature of the ground on which dams are to be constructed if sufficient data cannot be obtained from the outcropping rocks.

The best asbestos yet found in the United States occurs near the bottom of the Grand Canyon of Arizona. The quality of the asbestos is exceptional, but its situation in a reservation precludes its being worked.

A thick tempering oil, such as lard or whale, should be used in tempering chrome-vanadium spring steel; paraffine and other light oils should not be used. The bath should be kept as cool as possible, preferably by water circulating in pipes.

Electric sparking devices have been placed in one of the long tunnels of the Los Angeles aqueduct which is driven through oil-bearing strata so that any accumulations of gas may be ignited before they attain size enough to cause an explosion that would endanger the men or the work.

Fluorspar is prepared for the market by washing, crushing, and separating it from other minerals, after which it is ground for the finer trades. For foundry and steel making use it is sold unground as 'lump' or 'gravel' spar, in grades depending on color and degree of admixture of silica.

Continuous bucket elevators are those where the buckets are placed as close together as possible. This arrangement possesses the following advantages: the material may be fed directly in the buckets without striking the belt and wearing it out, the elevator requires no boot, and a greatly increased capacity is secured.

Compressed air in the foundry serves many uses: it operates molding machines, air-hoists, either independent or in combination with jib cranes, sand sifters, rammers, chipping hammers, and sand-blast for cleaning casting, pushes core oven cars into and out of the ovens, and promotes combustion in melting furnaces.

A valid appropriation of the water of a spring situated on a mining claim cannot be made without the consent of the owner of the claim. If the claim has been abandoned or forfeited there is nothing to prevent an appropriation of the water being made. If the water from the spring runs out and down a well-defined water course, it may be appropriated outside of the boundaries of the mining claim if no other prior rights have been acquired.

Briquetting tests conducted by the United States Geological Survey consisted of (1) the manufacture of briquettes to determine the adaptability of different coals to the process and the merits of different binding materials; (2) physical tests to establish the fitness of the briquettes to withstand weathering, transportation, and handling; (3) steaming tests to prove the calorific value of the briquettes in boilers of different types used by the Government, and, by comparison with the raw coals, the benefits to be derived from briquetting.

The mining law authorizes a junior locator to lay out the lines of his location so that the end of the junior claim laps over a senior location. The conflict area would belong to the senior claim. If the owner of the senior location subsequently draws in the boundaries of his claim so as to exclude the conflict area from the senior claim, the junior locator must amend his location and specifically include this area in his amended claim. If he does not amend his location, the area originally in conflict would revert to the public domain and be open to location. The junior claim would still be valid to the extent of the original area outside of the conflict.

Exports of iron and steel manufactures from the United States in the past fifteen years exceeded in value the corresponding imports by $1,400,000,000. In the fifteen years immediately preceding, on the other hand, imports exceeded exports by $300,000,000. According to the following figures published by the Bureau of Statistics of the Department of Commerce and Labor, the excess in value of exports over imports of iron and steel manufactures in the last 10 years is more than 2½ times the excess of imports over exports in the preceding 40 years:

Iron and steel manufactures.	40 years, 1861-1900.	10 years, 1900-1910.
Imports	$1,409,000,000	$307,000,000
Exports	973,000,000	1,411,000,000
Difference	$436,000,000	$1,104,000,000

A 235-mile natural gas line is being built for the Arkansas Natural Gas Co. from the Caddo Parish, La., gasfields to Little Rock, Ark. There will be several branches to supply cities on the way. The diameters of pipe are 12 in., 16 in., and 18 in.; there is one 20-mile stretch where a double line of 12-in. pipe is used. The line is to be constructed of plain end pipe connected by rubber-packed couplings, with the exception of five miles near Tupelo Springs, Ark., which will be constructed of screw-end pipe. The reason for the screw-end pipe is that a compressing station of three 1200-hp. units will be built at Tupelo Springs. Up to this point, a distance of 127 miles, the gas will be carried by the pressure at the wells, which varies from 465 lb. in the upper sands to 1000 lb. in the lower sands. Possibly two compressors may be installed near Vivian, which is in the gasfield. The main line will be from 2 ft. to 30 in. below the surface of the ground.

Special Correspondence

LONDON

Otavi and Tsumeb Mines — Mount Morgan Report — Robinson Deep — Treasury Mine

The Otavi and Tsumeb mines in German Southwest Africa are interesting ventures controlled in Berlin. The ore is rich and consists of a mixture of copper and lead sulphides. The higher grade is exported to Germany and the remainder smelted on the spot yielding argentiferous lead and a lead-copper matte. In spite of the low price of copper and the increased cost of mining the operations are highly successful and give satisfactory profits. The output last year was 69,360 tons as compared with 44,000 a year ago. Of this 32,500 was exported averaging 16% copper, 26% lead and 9 oz. silver per ton. At the smelter 16,000 tons of ore yielded 2940 tons of matte averaging 48% copper, 24% lead and 14 oz. silver together with 2732 tons of lead. The cost of mining increased from 11s 6d a year ago to 25s, a rise accounted for by the fact that the ore comes now from the second and third levels instead of from the open cut. Rock drills are employed and a system of filling exhausted stopes with limestone has been introduced. The expenses of mining during the year were £60,600, and of smelting £68,600, the cost of bringing supplies and of shipping the ore and products was £136,400, and £35,000 was allowed for depreciation. The income from sales was £411,400, and the profit was $100,360. The company also operates the railway to the west coast at Swakopmond, and made a profit of £84,300 from this source. After paying administration charges and interest on debentures, the net profit of the company for the year was £168,000. The ordinary shareholders receive £100,000, being at the rate of 10%, and the deferred shares, of which there are 200,000 of no face value, receive £40,000, being 5s per share. The company is taking an active part in the direction of the exploration work conducted by the Otavi Exploration Syndicate, a London company financed by English and German firms.

The report of the Mount Morgan Gold Mining Co., of Queensland, for the year ended May 31, shows that the total production of gold during the year was 187,867 oz. and of copper 7062 tons, obtained from 397,228 tons of ore. By chlorinating 124,122 tons of silicious sulphide ore, 57,217 oz. gold and 499 tons of copper were produced; the blast-furnaces produced 109,363 oz. gold and 6563 tons copper; and 52,917 tons of oxidized ore yielded 12,287 oz. gold. Owing to depletion of the oxidized ore the extraction plant has been finally closed. The yield per ton from the smelting ore was 9.93 dwt. gold and 2.98% copper, as compared with 7.77 dwt. and 2.85% the year before, and the yield from the chlorination plant was 9.19 dwt. gold and 0.4% copper, figures practically the same as before. The report does not give the figure for the amount of copper sold but the price realized was £60 per ton. The total revenue was £1,079,914 and the expenditure £712,722; in addition £24,706 has been allowed for depreciation of plant, £50,000 has been added to the reserve fund, and £60,000 more has been carried forward than was brought in from last year. The dividends absorbed £150,000. The coal strike in Australia did not inconvenience the mine and smelter, as large stocks of fuel were in hand, but the works of the Electrolytic Refining Co., at Port Kembla, where the Mount Morgan copper is now refined had to suspend operations for a time. The Boyne Valley railway from the mine to Many Peaks was completed last month, and the regular supplies of basic ore will in the near future replace the barren ironstone flux hitherto brought from Iron island. The plant has been enlarged by the addition of larger converters, so as to deal with the larger amount of matte that will be produced. The new system of filling old stopes has proved satisfactory, and no repetition of the cave of two years ago is expected. Much attention is being given to the question of improving the ventilation of the mine. Analyses of the air have not [illegible] gold was £877,056 or 28s. 3d. per ton milled. The working expenses were £542,313 or 17s. 6d. per ton milled, leaving a profit of £334,743 or 10s. 9d. per ton milled. The dividends distributed absorbed £343,000 being at the rate of 35% on the issued capital. The output and profit were smaller than in the preceding year when the figures were: output £1,092,224, profit £525,222, dividend 42½%. The profit per ton last year, 10s. 9d. compares with 17s. 7d. a year ago, and the extraction per ton 6.73 dwt. or 28s. 3d. compares with 8.3 dwt. or 33s. 8d. A year ago is was announced that to keep the mill going the average ore would have to be of lower grade, so that the fall in yields and profits was anticipated. The reserve of ore on March 31 was estimated at 1,050,000 tons, having an average assay of 7.23 dwt. C. D. Leslie, the superintending engineer, reports that this reserve does not include anything in the Main Reef; it is hoped that the ore can be mined at a profit, but figures will not be given until actual results are obtained. During the past year stope drills were introduced and at the date of the report 20% of the ore was mined by them. The miners have not as yet become accustomed to this type of work but the advantage of being able to reduce the stoping width by their use is already apparent. The mine has suffered a good deal lately from

Head-Frame at Mount Morgan Mine.

[illegible] the [illegible] deepening [illegible] of [illegible] cause or [illegible] but in the aggregate the [illegible] showed that the [illegible] are not [illegible] a [illegible] [illegible] [illegible]

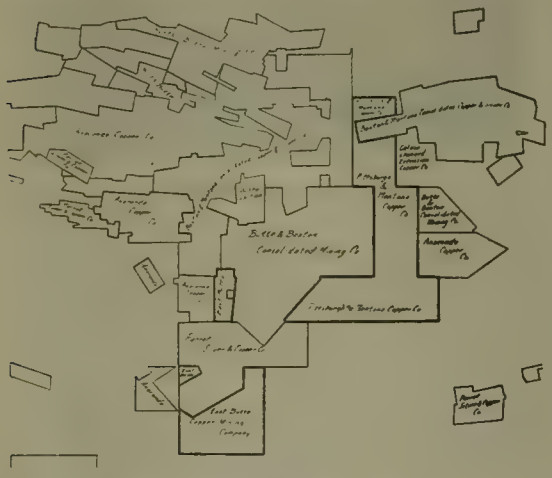
scarcity of labor, and during the latter part of the year, the mill was not running full time.

The days of the Treasury gold mine in the Central Rand are numbered. This is a small outcrop mine situated between Geldenhuis and Jumpers, and during recent years it has been under Neumann control. Dividends were first paid in 1892. In 1894 and 1895 additional property was acquired and the new plant, consisting of 40 stamps, was erected. At the same time the nominal capital was inflated to £540,000. The report for the year ended March 31 last, shows that during that period 148,154 tons was mined and after removing 26% of waste 109,235 tons was sent to the mill, which now consists of 60 stamps. The average assay of the ore was 6.4 dwt., and just 50% of this was recovered in the mill, the figures being 17,569 oz., or 3.21 dwt. per ton. The cyanide plant treated 82,043 tons of sand assaying 3.47 dwt., with an extraction of 2.83 dwt., and 26,871 tons of slime assaying 1.95 dwt., from which 1.67 dwt. was obtained. The total extraction was 5.76 dwt. or 90% of the content. In addition 7341 tons of accumulated slime was treated, averaging 3.54 dwt. and yielding 2.75 dwt. The total recovery of gold was 32,468 oz., worth £135,972, and the expenses were £111,096, leaving £24,896 as balance of profit. Out of this profit £6185 has been used for the extinction of the debenture debt and for the payment of interest during the year, and £1382 was spent in clearing a fall of ground and retimbering. The balance was carried forward. No dividend has been distributed for the last five years. The engineers estimated that on March 31, the reserve blocked out consisted of 201,580 tons averaging 5.68 dwt.; in addition the undeveloped ground is expected to contain 108,459 tons of profitable ore. The life of the mine may therefore be expected to be two years from the present date.

BUTTE, MONTANA

August Production.—Butte-Ballaklava.—Butte & Superior.

A good deal has been said and written during the past two months about the curtailment of the copper output. John D. Ryan, of the Amalgamated Copper Co., now in this city, does not deny that there is a curtailment in the production in this district, but he says that it is not of



Map of Claims at Butte, Montana.

sufficient size to create any alarm, and further he hopes that the curtailment at present in force will not last long. This curtailment has been brought about gradually and a glance over the figures shows that there has not been any decrease during the month just closed as compared with July. However, the mines of the district are hoisting and sending to the smelters a lower grade of ore, which will require more to produce the same amount of copper than has been shipped in months past. This means that the smelters at Great Falls and Anaconda will continue to receive almost their capacity of ore and that the mines will hoist even more, so that no more men will be laid off. The mines of the Anaconda company continue to work seven days and the mines of the Boston & Montana company six days per week. In reference to the curtailment matter it may be stated that the output of all the mines in the district in May was 27,103,000 lb. of copper, and that the August output was about 24,000,000, which means there is a decrease scattered among all the properties of 3,000,000 lb., of which the independent producers, the Butte-Ballaklava, the Tuolumne, East Butte, and miscellaneous small mines, contribute nearly 1,000,000 lb. The Boston & Montana group of mines contributed another million pounds, and the remainder is divided among the Anaconda group, which now includes the Clark properties. The August production of copper by the Butte companies is estimated at 24,762,800 lb., compared with 24,261,000 in July, and 26,317,200 in June, showing that there has been no further reduction in the output. The daily ore tonnage, average yield per ton, and gross daily yield of copper for August were as follows:

Companies.	Tons per day.	Yield per ton (lb.).	Yield per day (lb.).
Boston & Montana	3,000	70	210,000
Anaconda	4,270	62	264,740
Butte & Boston	500	63	31,500
Washoe	390	61	23,790
Parrot	130	64	8,320
Trenton	425	62	26,350
North Butte	1,000	64	64,000
Butte Coalition	1,420	70	99,400
Original	450	65	29,250
Tuolumne	100	85	8,500
Butte-Ballaklava	135	160	21,600
East Butte	120	80	9,600
Miscellaneous	25	70	1,750
Totals	11,965		798,800

The month's total tonnage of ore and total copper production were as follows:

Companies.	Tons of ore	Pounds of copper.
Boston & Montana	93,000	6,510,000
Anaconda	132,370	8,206,940
Butte & Boston	15,500	976,500
Washoe	12,090	737,490
Parrot	4,030	257,920
Trenton	13,175	816,850
North Butte	31,000	1,984,000
Butte Coalition	44,020	3,081,400
Original	13,950	906,750
Tuolumne	3,100	263,500
Butte-Ballaklava	4,185	669,600
East Butte	3,720	297,600
Miscellaneous	775	54,250
Totals	370,915	24,762,800

Work has been temporarily stopped on the ground in dispute between the Anaconda company and the Butte-Ballaklava company, pending the action of the court in the matter of the restraining order. In this connection John A. Percival, secretary of the Butte-Ballaklava company, has issued a statement in which he declares that there is no question as to the rights of his company. He says that for over one year the company employed its entire mining force on the work of proving beyond all doubt whether or not the veins opened apex on the Butte-Ballaklava property. He says the surface was trenched from one end to the other, laying bare the veins traversing it for a total length of 3600 ft. From the lower levels raises were made on these veins, showing direction and dip in such a conclusive manner as to establish beyond all doubt that the apexes of all the orebodies opened by the company were on the property. Work is still going on in the Ophir mine of the Butte Central Copper Co., but no effort has yet been made in the way of attempting to commence the sinking of the shaft from the 500-ft. level to a depth of 1500 ft. as proposed.

TORONTO, CANADA

Increased Market Activity — Bullion Shipments. Porcupine. Northern Ontario Development

There are some indications of a revival of interest in Cobalt mining properties and during the last week or so there has been a little more investment activity and an increase in the number of transactions sufficient to warrant the expectation of an active fall campaign. Shipments of ore are well maintained but otherwise there is very little news of interest from the camp. A noteworthy happening, however, is the rehabilitation of the Cobalt Townsite, the case of which had been for some time regarded as hopeless, which is now turning out ore and shipping steadily, having sent away 115 tons extracted from the shaft near the Buffalo. Some good ore has been also blocked out at the old shaft near the track, where work will be resumed later. A large consignment of bullion amounting to 687 lb. was recently shipped to London from four mines, the O'Brien, Temiskaming, Nova Scotia, and Silver Cliff. The O'Brien mine is now sending out most of its silver output in this form. With the exception of what was sent from the Buffalo there was hardly any bullion shipped from Cobalt previous to the present year. The quantity sent out by the Buffalo up to the end of 1909 amounted to 57,317 oz. and the O'Brien last year made a small shipment of 814 oz., whereas the shipments of bullion for 1910 amount to 353,963 oz. of the value of $196,685. The recent discovery at the 100-ft. level of the Hudson Bay is considered one of the most valuable finds of the present season, assays of the vein running over 6000 oz. per ton in some places. At the La Rose the value of the new vein at the 135-ft. level on the Princess property is confirmed, as assays of 1900 oz. extending over 2 in. of the vein have been obtained. The west stringer of the main La Rose vein, developed by a drift 20 ft. above the second level, has widened to 5 in., the ore containing between 2000 and 3000 oz. silver per ton. J. W. Astley, consulting engineer of the Peterson Lake, has resigned, his place being taken by S. M. Thorne, formerly of the Silver Leaf.

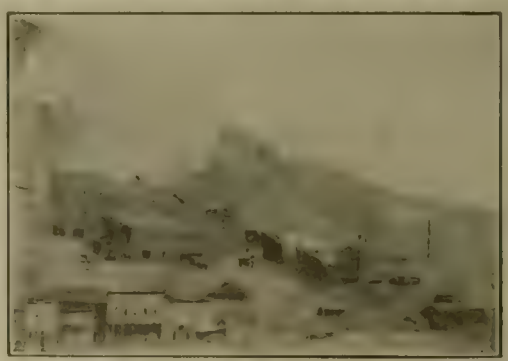
Favorable reports as to the progress of the Porcupine camp continue to be received, notwithstanding the drawback of transportation difficulties and scarcity of provisions, the principal development being in connection with the large group of claims held by what is variously known as the Timmins, McMartin, or Dunlop syndicate. It is composed of Noah and L. H. Timmins, John and Duncan McMartin, and D. A. Dunlop, and owns in all 70 claims on which three shafts are down, that on the Hollinger having reached a depth of 140 ft., and one on the Miller-Middleton property 100 ft. It is reported that $1200 per day in gold is being taken out, and that 50,000 tons of ore have been blocked out. The Dome has a Nissen 1200-lb. stamp mill crushing 5 tons of ore per 24 hr. day. The Porcupine Gold Mines Co. has 10 tons of ore which it is estimated will run about $1000 per ton. A stamp-mill will shortly be installed. The Scottish Ontario has a shaft sunk nearly to the 100-ft. level. When this is reached a cross-cut will be run across the entire lot.

There is some revival of interest in the gold mines of northwestern Ontario. The Lawrentian mine in the Manitou Lake area has been acquired by the Merger Mining Co. and will henceforth be known as the Merger. Development will be undertaken with E. R. Warner in charge. The Redeemer in the Eagle Lake district, will also be re-opened under the management of Frank E. Roberts, formerly of Arizona. The Ophir mine in the Kenora district, which has been closed for some years owing to litigation, will again be worked. A contract has been let for the sinking of a shaft on the vein. Mackenzie & Mann, of Toronto, the Canadian Northern Railway magnates, have taken up options on iron-ore claims covering 4410 acres at Grand Rapids on the Mattagami river on the Hudson Bay slope of northern Ontario, having outbid the United States Steel Corporation, which was anxious to obtain the property. They will put five diamond-drills to work immediately and it is stated that should the property prove up, the price to

SALT LAKE, UTAH

Coppetton Mill Dismantled — Electrostatic Zinc Plant — Park City Mines — Eureka Properties

The Coppetton mill of the Utah Copper Co. which was closed down a few weeks ago, will be dismantled and the equipment used in the remodeling of the old Boston Consolidated mill along Utah Copper lines. This will provide equipment for about one-fourth of the Boston Consolidated plant which will be shut down and remodeled in sections. Boston Consolidated has been entirely liquidated, the last formalities having been gone through with. Production of the Utah Copper for the month of July was 8,67[illegible],561 lb. of copper. Some details of the reported financing of the Ohio Copper Co. have been made public since the return of F. Augustus Heinze from his trip. He states that certain French bankers have agreed to sell $1,000,000 worth of Ohio bonds within three months from October 10. This means that the money will not be available to the company until January 10 and as the issue is not underwritten, they do not make any guarantee to deliver it at that time. This announcement coming after definite statements that the company had been financed, is a disappointment to stockholders, but Mr. Heinze is confident that the bonds will be sold and the money paid over



Yampa Smelter, Bingham Canyon.

at the time stipulated. The mill is in such shape that the installation of the remainder of the equipment will not take long.

At the International smelter matte has been tapped and two converters are in operation. The Utah Consolidated tramway is delivering about 700 tons of ore per day and is being put in shape to handle the full amount called for. Announcement has been made that four of the reverberatories will be put in shape as soon as possible, this being one more than originally expected. F. W. Cowans, formerly of Mexico and Peru, has been appointed superintendent for the Utah Consolidated, and will have active charge of the operation of the property under the direction of Roscoe H. Channing, consulting engineer. These changes have been brought about by the resignation of J. B. Risque, general manager for the company. Mr. Channing was manager previous to Mr. Risque.

The United States Smelting Co. is making some experiments with its electrostatic zinc plant, at Midvale, with the object in view of materially increasing the capacity. If this cannot be accomplished with the present plant an addition will be built. The working force at the mine has been materially increased. The Yosemite, which was recently unwatered and which has opened good ore on the lowest levels, is to resume active operations at once. New equipment is to be installed at the shaft which will be cleaned out and put in shape. The mine which operated as a lead producer above the water-level will now be worked for its copper content. A large portion of the stock is con-

trolled by the Bingham Mines Co. This company has taken over the Sampson recently. Since the closing of the Yampa smelter it is shipping to the American Smelting & Refining Co. At the Daly-Judge the company is experiencing no trouble in holding the 1600-ft level which was recently unwatered for the first time in twelve years. A few of the old drifts have been found caved but some ore has already been opened and it is on this level that the mine penetrates the Ontario quartzite which has produced most of the wealth of this zone. The Daly West has struck some good ore on the 1900-ft. level while extending the drift from the Ontario drain tunnel to the Daly-Judge. Work has been started extending the 2100 or main tunnel-level to the point where the ore thus found should appear below. Some Colorado capitalists are negotiating for a long-term lease on the American Flag with the privilege of buying a large block of the company's treasury stock. The Gold Chain and Opohongo have entered into an agreement which should result to their mutual benefit in installing a joint hoisting and power equipment. A new 16-drill compressor has been ordered and plans are being made for new hoisting works for the two companies.

The new pumping equipment of the Centennial Eureka met with a peculiar accident in that the water column expanded due to the water being slightly warmer than the air in the shaft, the column being rigidly fastened at the top, buckled so that it was necessary to shut the pumps down while repairs were made. These are practically completed so that the plant will be in operation in a very few days. A case of long standing in the courts was decided in the Supreme Court and by it those Success stockholders who have been suing for a block of Colorado stock have lost on all counts. The proposed merger of the South Columbus Consolidated and the Alta Hecla is being met with considerable opposition and both sides are out with statements of their case. Those in favor of it claim that it will lift the stock out of the cheap class and place the company in a position to go ahead and develop its property and prove it up while the opponents claim that the South Columbus is worth far more than will be paid for it by the terms of the proposed merger and that the benefit will accrue almost entirely to the Alta Hecla. The meeting of the stockholders to ratify or reject will be held this coming week and there should be some interesting developments.

JOHANNESBURG, TRANSVAAL

The 'New Metallurgy' on the East Rand. — June Output. — An Unfortunate Venture.—The Farvic Mine, Rhodesia.

For the past four or five years the average Witswatersrand stamp-duty has been steadily increasing on account of the employment of much heavier heads, coarse screening, and tube-mills. Not a few mines have been maintaining eight tons per day duties for several months, but all records in this respect have now sunk into insignificance in the light of recent milling operations at the East Rand Proprietary mines. E. H. Johnson, consulting metallurgist to this company, has for some considerable time past been experimenting at the Angelo & Cason mills in the direction of higher duty, and as a result of his investigations 80 stamps supplemented by 8 tube-mills are now running there (40 in the Cason and 40 in the Angelo batteries) at a duty of about 25 tons per day. Mr. Johnson anticipates that in a few days' time the duty will be 30 tons. The East Rand Proprietary is now operating 820 stamps and 24 tube-mills. The distribution of the stamps is as follows:

	Stamps.
Driefontein mill	220
Angelo mill	220
New Comet mill	160
Cason mill	220
	820

The Driefontein and New Comet batteries are steam-driven and are more costly to operate than the more modern electrically-driven mills of the Angelo and Cason. The proposal now receiving the consideration of the company is the cessation of work at the two older steam-operated mills and the concentration of reduction operations at the Angelo and Cason plants. The experimental work carried out on a large scale in these two latter mills has shown that the company will, with these 440 stamps at work, supplemented by a large number of tube-mills, be able to crush more ore than the full 820-stamp equipment milled under the old working conditions. This will naturally result in substantially decreased working expenditure and it is important to learn that at the 80 stamps, where the high duty already referred to has been obtained, the pulp leaving the mortar boxes has been even finer than the product leaving the batteries where such an ambitious crushing scheme has not been carried into effect.

This is one important result which will be secured to the company through the full adoption of the project for the consolidation of the four properties achieved a year or two ago, as there will now be no necessity or question of having to operate this or that mill or haul ore through this or that shaft because they belong to any particular company. The Angelo and Cason batteries are well situated as regards the shafts and crusher stations of the four mines, and the new scheme which has only been rendered practicable through amalgamation will, when carried completely into operation, have a most marked and satisfactory effect on the profit earnings of the company.

The statistics prepared by the Transvaal Government Department of Mines for the month of June show that 103 gold mines were dropping stamps during the period. The total stamping capacity employed was 9853 heads and in addition 182 tube-mills were at work. The following tables state the distance of these mines from Johannesburg, the number of stamps and tube-mills operated in different areas, and the quantities of ore milled:

	No. of miles.	Stamps at work.	Tube-mills at work.	Tons milled.
Witwatersrand area	62	9,240	173	1,775,586
Heidelberg	3	125	2	19,637
Klerksdorp	4	40	3	4,000
Pretoria	1	5	..	410
Barberton	15	230	1	16,393
Pilgrim's Rest	15	183	2	18,420
Pietersburg	3	30	1	2,264

Of the total tonnage milled in the Transvaal only 2300 tons out of a total of 1,837,000 were reduced in the first place by other means than gravitation stamps, a fact which indicates the general similarity of practice in Transvaal ore reduction, although of course there are large variations in detail at the different mines. The yields of the mines during June were:

Witwatersrand	£2.517,206
Heidelberg	30,558
Klerksdorp	4,687
Pretoria	241
Barberton	21,343
Pilgrim's Rest	49,652
Pietersburg	2,853

It is officially announced that the Vogelstruis Consolidated Deep mine near Florida is being closed down. The company commenced milling at the beginning of the year and has declared a substantial loss each month. Three or four weeks ago a circular was addressed to shareholders inviting them to subscribe £210,000 for a debenture issue, the proceeds to be devoted to further developing the mine and increasing the milling plant from ten to fifteen thousand tons per month capacity. This invitation has met with an exceedingly poor response; scarcely to be wondered at considering that the company is already heavily in debt, and that if it is to be turned to profitable account the proposition will have to be developed and equipped on a substantially larger scale than was mentioned in the circular. It is not often that a Main Reef venture has to be admitted unprofitable, but it is clear that the Vogel

Deep has, to date, been an utter failure as a separate mine, and shareholders in the company must now see what comfort they can from the nebulous prospect of the company's claims being at some day included in an amalgamation scheme.

Yet another Rhodesian mine which hitherto has been worked as a tributing venture is to be floated with a substantial working capital and a large authorized capital. During the past year or two several properties in the Matabeleland and Mashonaland provinces of southern Rhodesia have been acquired from small mine workers and tributing syndicates by influential South African mining houses and have been floated under important auspices. For instance the Buck's Reef Gold Mines acquired from Mr. Wood the Buck's Reef mine. The company has a capital of £150,000, the sponsors in the formation of the company being H. J. King and S. Neumann & Co. Then, too, the Lonely Reef was purchased by Lewis & Marks from Palca & Aserman, the fortunate owners receiving £125,000 in cash and 75,000 shares in the Lonely Reef G. M. Co., which has an issued capital of £271,000. The Masterpiece mine in the Hartley area has been sold for £100,000 in cash, and the latest addition to the list of mines previously worked on a very small scale, and now being taken over by large companies is the Farvic. This property is situated in the Gwanda district of Matabeleland and has been worked on tribute for some months past by Rhodesia, Ltd. The adjacent Colleen Bawn mine is equipped with a 6-stamp battery, cyanide, and slime plant and these have been employed by the Farvic. Some idea of the high-grade nature of the ore found may be gained from the fact that for the six months ended March 31, 4461 tons were milled for a total yield of £45,036. In May the value of the output was £6198 and a profit of £3842 was earned. The owner of the Farvic claims, H. S. Henderson, and Mr. Stewart, manager of Rhodesia, Ltd., are now in England arranging for flotation of a company to take over the mine and work it on a scale commensurate with its possibilities.

NEW YORK

Market Stagnation.—Bond Issues.—Ebner Gold Mine. — Copper Companies.—August Exports.—Canadian Production.

A committee of citizens from Jim Fiske's native town once solicited him to contribute toward a fence to be built around the local cemetery. Fiske's reply was that "the burying ground did not need any fence. Those that were in could not get out and those that were out did not want to get in." Words could hardly express more aptly the condition of the securities markets at present. Not only do those who are out not want to get in, but they refuse to come in upon invitation, entreaty, command, or compulsion. The volume of business upon the New York Stock Exchange has dwindled to small proportions. The course of prices has been such as to demonstrate clearly the fact that the larger interests, the bankers for the leading railroad and industrial corporations, are in complete control of the market. Complete control of everything except the absorbent element which they find themselves powerless to build up. Mr. Roosevelt's series of speeches made on his Western trip, has not helped to quiet the financial unrest prevailing. Just how far the political situation is to affect the securities market is yet to be seen. The present stagnation is almost as complete as possible. Some revival, at least, of activity must be expected. The situation in the coppers has developed into a waiting game. The copper curtailment is evidently to eliminate accumulated stocks as a market menace; on the other hand, a marked decrease in consumption is inevitable under prevailing business conditions. The cutting down of production has undoubtedly averted a violent upset in the metal market and a further drastic shrinkage in the copper share list. Under present circumstances the metal market must wait upon general business conditions before the hoped for revival can take place. In the meantime the gathering of the copper industry into compact form in a few hands goes on rapidly. Consolidations are in progress wherever feasible. The announcement made last week that the Nevada Consolidated-Cumberland Ely merger had been consummated was a little premature. A group of stockholders representing in all some 5200 shares of stock, organized at the last moment under the leadership of a New York Stock Exchange house, and secured a temporary injunction preventing the contemplated transfer of the Cumberland Ely property. The Nevada Consolidated management has unofficially made an announcement that, if the rebellious stockholders insist upon holding their position, it will only result in the continuation of the present status and the maintaining of a separate corporate existence for Cumberland Ely for the benefit of 11% stock interest, 98% of the outstanding stock of Cumberland Ely being in the Nevada Consolidated treasury. Both of these concerns, together with Utah Copper, have just declared regular quarterly dividends. Cumberland Ely, 10c. per share, practically all of which goes to Nevada Consolidated, the latter is paying 37½c. per share, of which almost exactly half goes to the Utah Copper Co., which is in turn disbursing 75c. per share. When Utah Copper shall have absorbed Nevada Consolidated, Ray Consolidated, and Chino, as it will in due course without doubt, it will be in position to take the leadership in copper from Anaconda. In fact, Utah Copper is already encroaching upon Amalgamated marketwise. There are many holders

Copper Flat, Ely, Nevada.

of Amalgamated who bought well above par and who are far from satisfied with the return of $2 per year derived from Amalgamated, quoted in the present market about 64, especially when compared with Utah, quoted at 46 and returning $3 per year. On this basis two shares of Amalgamated will practically buy three shares of Utah, upon which the return is $9 per annum, as against $4 on the two shares of Amalgamated. Commission houses are said to be executing many such 'switches.' In view of prevailing conditions, the growing importance of the porphyries and the dominant place they are to occupy, at least during the next few years, it is hard to find any argument effective against the potent one of greater income. A copper cost of 5¾c. per pound for its last quarter and on a production of over 18,000,000 lb. marks Nevada Consolidated as the lowest-cost large producer of this country, if not of the world. Utah Copper's production at a rate of more than a hundred million pounds per annum, is showing a net of something more than 10% upon its $15,400,000 outstanding stock, and these results have been reached in the face of the most discouraging metal market seen for some years. The other Guggenheim dividend payers are declaring the usual quarterly disbursement; Yukon Gold, 10c. per share, which is at the rate of 8% per annum; and Guggenheim Exploration, 2½ per cent.

The calling in of all of the outstanding bonds of the Butte & Boston Consolidated Mining Co., a little more than $500,000, for redemption is claimed to wipe out all of the bonded indebtedness against the group of properties controlled by the enlarged Anaconda. The incident has also directed some attention to the large part played by convertible bond issues in recent mine financing. The Nevada Consolidated bond issue has all been redeemed, but before they were converted they sold at $400. The bond

issues put out by the Utah Copper and by the Boston Consolidated also sold at much above par. The conversion privilege gives to the bond all the speculative value that lies in the stock, while the lien upon the assets ordinarily ensures such minimum of risk as satisfies more conservative investors. Some new issues have appeared recently; the principal ones being Ohio Copper, $1,250,000, a million of which F. A. Heinze says he placed with French bankers while abroad; Miami Copper, $1,500,000; South Utah, $3,000,000; Utah Copper, $2,500,000 for the financing of the Bingham & Garfield railroad; Mason Valley, $1,000,000, the proceeds to be used in the erection of a smelter at Yerington; and Braden Copper, $4,000,000, to be sold to equip the property in Chile and provide transportation facilities. A survey of the financing required in the development of the modern porphyry copper property shows as distinctly as any phase of the mining industry, the great growth of the coppers. That the financing is needed to be on a large scale is shown by the recent placing of one order for 1500 Isbell vanners to go into the mills of Ray Consolidated and Chino. This is claimed to be one of the largest orders for mining machinery ever placed in this country.

It is not, however, the coppers alone that are requiring equipment. The California Nevada Copper Co., which controls the Ebner Gold mine near Juneau, is building a 200-stamp mill, which is to be simply the first unit of a plant which is to have 1000 stamps of 1500 lb. each before it is completed. This first unit of the mill is expected to be in operation before the first of the year. This property is held to be another Alaska Treadwell, with immense orebodies of free-milling ore averaging about $3.50 per ton. The property is opened by two adits; the millsite is at the portal of the lower one, so that ore will come to the bins by gravity. Mining and milling costs are expected to be between 60 and 75c. per ton.

The special meeting of the stockholders of the Miami Copper Co. was held this week to ratify the proposed increase in the capital stock of the company. J. Parke Channing, head of the engineering staff of the General Development Co., stated at the meeting that the present developed ore of the Miami totals between fourteen and sixteen and a half million tons, that the copper content will be well toward 3%. The Miami mill is to be in operation in January, the present mill is to handle 2000 tons per day, but foundations have been built for an addition to be erected as soon as possible after the present mill is operating. The situation in Giroux is not wholly satisfactory. The company has adopted a policy of withholding all information both from shareholders and from the public. It was anticipated that shipments from the Giroux would probably begin when the smelter at Tooele was blown in. The first pouring of copper at the new smelter was made this week, but the date of initial shipments from the Giroux is still a matter of conjecture. There has been much selling of Giroux in the open market, some of which, conducted through one of the largest New York Stock Exchange houses, is said to have been for treasury account. Friends of the property argue that Thomas F. Cole, the managing head of the company, would not endorse the expenditure of $125,000 upon the five-compartment Alpha shaft if there was not demonstrated tonnage to justify it. Nevertheless, Giroux could make a lot of friends in the market now by putting forth a frank and complete statement covering finances and physical conditions, particularly the latter. The merger of the Superior & Pittsburg and the Calumet & Arizona is still under consideration, but is halted by a somewhat unusual obstacle. Superior & Pittsburg is organized under the laws of the State of Minnesota, which in such case require the unanimous vote of the stockholders. It is conceded that it would be almost or quite impossible to secure proxies representing every share of stock.

August exports of copper have been large, amounting to 62,666,240 lb., according to custom-house returns. Notwithstanding the heavy exports ruling throughout the earlier part of the year, the European visible supply has steadily decreased since February 15 up to August 15, thus showing an enormous consumption abroad. Germany, in particular, is just now crowding her factories to the utmost and is using unprecedented quantities of copper. The increase in the visible supply during the latter half of August amounting to some 2,000,000 lb., was fully discounted as the result of the known heavy exports. Domestic deliveries for August are estimated at 60,000,000 lb., and while production is hard to estimate, it is believed that the coming report of the Copper Producers' Association will make a very encouraging showing as compared with the earlier months of the year.

The Dominion Department of Mines has just issued a report covering the mineral production of Canada during 1909. The total exceeds $90,000,000, as compared with about $86,000,000 in 1908. In the production of gold there has been a large shrinkage. In 1900 the gold production of Canada was $27,908,153; in 1907 it was $8,382,780; in 1909 $9,790,000. As the gold production has decreased the silver output has swollen. In 1900 the latter totaled $2,740,362; in 1907, $8,348,659; in 1909, $14,358,310.

The Batopilas Mining Co. shows, by its annual report, a net profit for the year 1909 of $52,782.12 and a total surplus of $3,268,534.61. The Batopilas numbers among its board of trustees some of the most influential men in New York, among them being Morgan J. O'Brien, who was a co-trustee of the Equitable Life Assurance Society with the late Grover Cleveland; and Judge Henry E. Howland, one of the best known members of the New York Bar. Goldfield Consolidated, listed upon the New York Stock Exchange some weeks ago, has now complied with all the requirements of the listing committee and is now traded in on the floor. The shares passed by the committee aggregate $35,591,480. The mining market in London is said to be fast recovering its strength, now that the rubber and oil booms have run their course, and not a few promotions are being shaped up to be taken to England. An increasing English interest in Mexico is apparent, and the recent examinations made for the Rothschilds in Cananea are believed to be the forerunners of some heavy purchases of mining ground in northern Sonora by these financiers. The El Rayo Mines Co. reports a net profit, for the quarter ended July 31, of $88,524, won from 13,900 tons of ore of an average value of $14.48 per ton. El Rayo is in process of absorption by the Mines Company of America, which is also to absorb the Dolores Mines Co. After this merger is completed, Mines Company of America is to be listed upon the New York Stock Exchange. Boston capitalists have become interested in the Arizona Mines Co., which is developing 144 acres of ground in the Castle Creek mining district, Yavapai county, Arizona. Five thousand shares of stock have been sold to provide working funds, and the stock sold has been listed on the Boston Stock Exchange.

RADERSBURG, MONTANA

Keating Gold Mining Co. — Black Friday. — Radersburg-Rena.

The Keating Gold Mining Co., operating in Radersburg district, is shipping five cars of ore per week to the Pittsmont smelter at Butte. The wagon haulage of eleven miles to Toston costs $2 per ton, and freight charges from Toston to Butte are $1.25. Most of the ore being shipped consists of gold-bearing iron sulphide, containing some silver and copper; the average value being somewhere between $12 and $18 per ton. It is understood that the iron content is paid for as FeO at the rate of 10c. per unit, instead of as Fe at some other plants. These ores are free from zinc. The principal workings are on the Blacker-Keating vein, described in the *Mining and Scientific Press* of August 6. The old Keating vertical shaft and the new incline shaft are 800 ft. apart. The former, 400 ft. deep, is equipped with a Sullivan air-compressor, and a hoist operated by compressed air; also, an air-driven pump at the 400-ft. station, which is lifting 75 gal. of water per minute. At the incline shaft is the electric sub-station connected by an 18-mile transmission line to the plant of the United Missouri River Power Co., situated at Boulder, supplying power for a 12-drill air-compressor, Ingersoll-Rand, and a Nordberg electric hoist by which a 1½-ton skip is operated

between [illegible] of the [illegible] The 6-ft [illegible] to the west about 100 ft. to the [illegible] has a dip west of 30 degrees. The lower level is 100 ft. below the [illegible] and is connected with it by a crosscut. [illegible] open to the west from the 6-ft. and 6-in. stations. The advancement at the latter point is at present heading west at each of these stations. The 100-ft. level of the old shaft corresponds to 175 on the incline. This level is 100 ft. long extending from the old shaft northward on the vein to the new shaft and 50 ft. beyond it. There is still a considerable amount of stoping ground above this level. The newer development is on the fifth level, which is at the depth of 575 ft. on the incline. Driving on the vein is in progress with air drifts in both directions resulting in establishing a level several hundred feet long. Raises are being made in ore for the purpose of starting the work of stoping. The face of the incline has just reached the depth of 675 ft. where a crosscut is being driven to the vein, the purpose being to start driving at this station and open level No. 6. The body of ore between the fourth and fifth levels gives promise of yielding a good tonnage. When the fifth level is extended south to a place immediately below the old Keating shaft a raise will be made to connect with the latter to establish good ventilation. The vein is between hard, well-defined walls, and the vein filling, as a general practice, is all mined and shipped. While the average width is probably close to two feet, there are places where the vein widens to five feet, and others where it pinches to less than six inches. It is stated that the old workings, those at and above the 200-ft. level, contain considerable oxidized ore of milling grade. The mine superintendent is R. High tower.

The Black Friday mine, situated about two miles from the Keating, was taken possession of on February 1, 1909, by the Toston Leasing & Mining Co., under a bond and lease. The lessees shipped 1002 tons of ore between June 1909 and March 1910, the net returns for which amounted to $43,372, or $43.28 per ton. Parties in control of the lease organized last March the Black Friday Gold Mining Co., which took over the lease and assumed the obligations thereunder. Since doing so considerable ore has been shipped which yielded an average of $45 per ton. The sampling showed the lowest to have assayed $28.75 and the highest $100.66 per ton. At present shipments amount to 20 tons per day. The shaft is an incline which has reached a depth of 500 ft. on the foot wall. There is said to be 200 ft. of stoping ground above the 400-ft. level. Driving on the 500-ft. level is in progress, there being 3 ft. of ore in the face of the drift which assays $50 per ton. A raise in ore is being made from this level for the purpose of starting stopes. The ore in this raise is said to be 8 ft. wide. The plan is to sink below the 500-ft. station. The hoisting is done with steam-power, but the intention is to install an electric hoist within the next few months and obtain power from the United Missouri River Power Co., whose line passes close to the mine. It is stated that the final payment on the bond is to be made within the next 30 days, when the Black Friday Gold Mining Co. will have complete ownership of the mine. Willard Bennett, A. J. Galen of Helena, R. M. O'Hearn, and A. B. Bennett of Toston are the officers of the company, the last named being general manager. The ore characteristics of the Black Friday are similar to those of the Keating, though the grade of the former is the higher of the two. Ample power for mining and milling is available, as the United Missouri Power Co. has just completed a new generating station.

The Radersburg-Rena Gold Mining Co. is developing the Rena, half a mile north of the Keating, on which there is a 250-ft. incline shaft on the vein. Some driving has been done from the 250-ft. station in sulphide ore, shipments from which sampled 38 to 44% iron and $30 gold per ton. The property has a steam-hoist and the intention is to do more sinking. The matter of connecting with the electric power-line and using an electric hoist is being considered. F. H. Donaldson of Helena, C. E. Gruwell of Butte, and J. H. Tullock of Lombard are most concerned in the property, Mr. Donaldson being the manager.

FAIRBANKS, ALASKA

New Discoveries – Increased Milling Facilities Needed – Value of Shipments

New gold discoveries have been reported of late, and the previous finds have stimulated prospecting, and the whole belt between Ester dome and Pedro dome is attracting renewed attention from sourdough prospectors and cheechakoes alike. Though most of the good prospects lie within a few miles of Pedro dome near the Cleary summit, the formation around Ester is just as favorable. After the finds of Herschberger, Fredericks, and others on the ridge connecting Ester and Pedro, several miles from the older district, chances for further extensions of the gold belt are greatly enhanced. While the prospectors are hard at work the mill at Fairbanks is grinding steadily on high-grade ore. Now that the stamps have been enlarged to 900 lb. the tonnage is greatly increased, though even at that, shipments are ahead of the capacity. During July several good clean-ups were made. A 5-ton lot from the Lawson, Zimmerman & McCarty veins at the head of Wolf creek assayed $90 per ton in free gold. About three tons of this lot was practically waste, showing that the value of the ore must have been more than double this figure. Lucien Rhodes also put through a 6-ton lot which resulted in a retort worth over $900, being of slightly better grade than usual. Other mill runs from the same property have averaged $150 per ton. Charles Crawford, who operates a lease on part of the Rhodes Hall vein, is now shipping steadily from his winter dump and from his present workings. Spaulding & Clough are working on their adit. This property is at the head of Dome creek on the right limit and rich ore has recently been extracted, the gold being coarser and brighter than that in the shaft at the upper end of the claim. They have found no indications so far to show that the pay does not extend the full length of the claim. George and Ed. Thomas have taken a lease on the Wild Rose claim, the extension of the Spaulding Clough property. Ed. Thomas has till recently been placer mining on the lower end of Dome creek.

The arrastre at the head of Skoogy gulch built by S. Serafford is running steadily. The last clean-up was reported as showing $50 per ton of ore crushed. As the ore is friable, about two tons is crushed per day. The Redwing Leasing Co., owned by Emil Furstenau and S. R. Calvin, is installing a hoist on their lease of the Jupiter-Mars property. Cross-cuts at the 60-ft. level have opened a good grade of ore. Work has commenced on the foundations for the Chena customs mill by Martin Harrais and associates. While only part of the machinery has arrived, the entire outfit should be on the ground soon. It is understood that the equipment will be complete in every respect. Lawson, Zimmerman & McCarty are figuring on installing air hammer drills at their properties at the head of Wolf creek. The order will probably be telegraphed to San Francisco in a few days, so the last through boat to St. Michael can bring in the drills before the close of navigation. As the company intends to sink at least 150 ft. and cross-cut 100 ft. each way, the use of power-drills will greatly facilitate the work and save at the same time a large labor bill.

Advices from Fairbanks creek state that the Cook brothers have opened a much larger body of high-grade galena than was shown in the first prospect shaft. Samples from the first shaft showed a large percentage of lead and 220 oz. of silver. Horton and associates have just brought in samples of ore from their vein showing a high value in free gold. The gold is coarse and bright. Some of the specimens are as rich as any yet found in the district and look to be worth about $30 per pound. In this vein antimony is the base metal, and where it shows the strongest, the value changes to silver. Representatives of the Copper River & Northwestern railroad are in Fairbanks at present looking up possible tonnage in case the road is extended to Fairbanks. They are at present engaged in visiting the mines, although they will also note the agricultural possibilities of the district. A large amount of farming land would be made available by such a road.

General Mining News

ARIZONA

COCHISE COUNTY

The fifth level has been started in the Centurion mine at Dragoon, and the management plans to commence shipping ore to the smelter within the next two months. It is probable that the first ore shipped will be sent to the Copper Queen smelter at Douglas.——Thomas Higgins has completed a survey for a patent of 40 claims some of which adjoin the Centurion property.——Operations are to be resumed at the Jim Neal group within the month.——New machinery is to be installed and work resumed at the Pawnee group in the Paradise district. Assays of the ore running $38 gold with 12% copper have been obtained recently from the shaft which has been sunk 100 ft. on the vein. There is also a 180-ft. drift on the claims.——The assessment work is all that is being kept up at the Bradshaw & Arizona at present, but it is planned to do some extensive diamond-drilling the first of the year.——The officials of the White-

Map of Arizona.

tail company are considering the erection of a mill to treat custom ore as well as that produced from their own property.

GILA COUNTY

(Special Correspondence).—The diamond-drill on the 660-ft. level of the Superior & Globe mine is running at a depth of 230 ft. The rock drilled so far has been an unaltered diabase of adamantine character. The bits had to be re-set every five feet of drilling. Today, however, the drill penetrated a soft streak filled with iron-stained vein matter several feet in width which was probably a stringer or parallel vein to the main fault. The drill is being sunk on an incline with the dip of the vein so as to penetrate it at a depth of 600 ft. below the 660-ft. level. It will take between 60 and 80 days to finish this work.

Globe, September 3.

MARICOPA COUNTY

B. N. Weinsheim, of Colorado Springs, has secured an 18-months' lease and bond on the I.X.L. group of claims in the Vulture district, from A. J. and J. A. Kellis. The group includes five claims which have been under development for three years resulting in the opening of considerable high-grade ore.

MOHAVE COUNTY

Work on the Pilgrim group continues to expose good ore in the cross-cut and it is reported that the property will be taken over by Salt Lake interests in a short time when extensive development will be carried forward.——W. A. Mensch has installed an engine and a blower at the Enterprise mine. There is a large force at work on the ground and it is the intention of the owners to open the claims several levels below the present workings.——The shaft of the Richardson brothers at the London mine in the Union Pass district is down 100 ft. Sinking will be continued several hundred feet as the vein at this point has every indication of developing a rich orebody.——The work of getting the old mill at the Gold Crown mine in running order is well under way and it is thought that the plant will be in operation by December 1.——The shaft at the C. O. D. mine will soon reach the 400-ft. level where a station will be cut. The water in the upper levels is all being caught at the 200 where it is easily handled by the station pump. There is little water below that level and this is all hoisted in the bucket.——At the property of the Wallapai King Mining Co. the shaft has cut the vein at a depth of 110 ft. and is being sunk to the 200-ft. level where a cross-cut will be driven to the ore. It is thought that the shoot will show a high percentage of sulphide when cut below the water level as the vein in the upper portion is oxidized and assays well in gold and silver.——The new working shaft at the Ruth is progressing rapidly toward the orebody opened on the 100-ft. level by the west drift. The company has purchased the old mill of the Arizona Pyramid Gold Mining Co. and will move it to Silver creek.

PINAL COUNTY

The Maverick group of claims which was taken under lease a short time ago by the Copper Queen Consolidated Mining Co. is now being developed under the supervision of M. C. Milton. A shaft is being sunk to the 100-ft. level where the orebody will be cross-cut.

YAVAPAI COUNTY

(Special Correspondence).—J. J. Fisher reports the development to be going ahead steadily at the Little Daisy mine, in the Jerome district. A cross-cut at the 800-ft. level has recently opened a body of ore that assays well in gold with a high percentage of native copper. A large fan was installed last week to facilitate ventilation. Two shifts are at work a total of 20 men being employed.

Prescott, September 2.

YUMA COUNTY

There are about 50 men at work at the old Mudersbach mine in the Swansea district which was recently taken over by George Mitchell, and considerable ore is being shipped to the Clara Consolidated at Swansea. Two hoists, gas engines, and air-compressors have been shipped to the mine.

CALIFORNIA

AMADOR COUNTY

The Original Amador Mines Co. has filed a suit against the Amador Keystone Mining Co., asking for $150,000 damages. The plaintiffs claim that the defendants have been extracting ore from the property of the plaintiff company at Amador City since 1897 and the value of such ore reaches the sum named as damages. The plaintiffs also allege that prior to May 25 they had no means of ascertaining whether such ore was being extracted as the defendant company refused to allow an inspection of the workings.

KERN COUNTY

(Special Correspondence).—At the instance of the Kern County Board of Trade, a committee of oil men has sent to Mr. Taft, Mr. Ballinger, and the California congressmen, a telegram embracing a resolution regarding the oil-lands situation. After calling attention to the hardship and attendant financial loss caused by the present manner of allotting Government oil lands, the resolution prays that the Secretary of the Interior be asked to conform to the former ruling and settled policy of the Government ex-

tending over a period of ten years. The board made it of record also that it is opposed to any system of leasing of oil lands by the Government. Two changes in the existing laws were suggested as a cure for present evils: first, that all locations be recorded in the General Land Office and when so recorded no other locations be allowed on that land until it can be proved that the first location is faulty; second, that the acreage to be taken by any one man be limited. Violations of this provision to be punished by a heavy fine and imprisonment.

Bakersfield, September 6.

LOS ANGELES COUNTY

(Special Correspondence.)—The third meeting of the Western Oil Producers' Association was held here on the evening of September 1. The meeting was representative of the oil operators throughout the State, although there were not as many present from Bakersfield and San Francisco as had been expected. Supporters of different policies entered heartily into arguments favoring their views, but there was an absence of the almost hostile spirit that has characterized the previous meetings of the association. There was evinced a desire to make concessions to the operators of the north. After discussing and voting on many motions, it was finally decided that the voting for the eleven directors of the association will be by letter, that the votes be canvassed at the next meeting to be held on the evening of September 8, that a full list of members be sent to all who have signed the membership roll, that membership rolls be sent to Bakersfield, Coalinga, and San Francisco for new signatures; and that the names of the men to be voted on for directors be selected by the meeting. During the meeting telegrams were read from the Bakersfield and Coalinga Chambers of Commerce asking for sufficient delay for the operators of the northern fields to secure representation. The membership roll now includes over 100 names and it is expected that this will be doubled by the time of the next meeting.——The statement that the Standard and Associated companies had bought the entire surplus of the Independent Oil Producers' Agency, at 30c. per bbl., is denied by officials of the agency. It is true, however, that oil is being bought in the open field for 30c. per bbl. Also, it is freely predicted that the price will go lower, although some doubt is expressed on this point by prominent operators. The drop in price was not unexpected in the face of the large production in the various fields of the State, and it appears that even a lower price would not be out of keeping with the present output.

Los Angeles, September 6.

NEVADA COUNTY

The drift at the Black Bear mine, at Moores Flat, is still in the shoot from which $5000 worth of high-grade ore was sold a short time ago. The ore was hand-sorted before it was shipped to Nevada City for reduction, and it is estimated that there is approximately $30,000 worth of milling grade on the dump. No stoping is being attempted, the ore which is being stored all coming from development. C. L. Wilson, the manager, will probably let a contract for the construction of a mill in the near future.

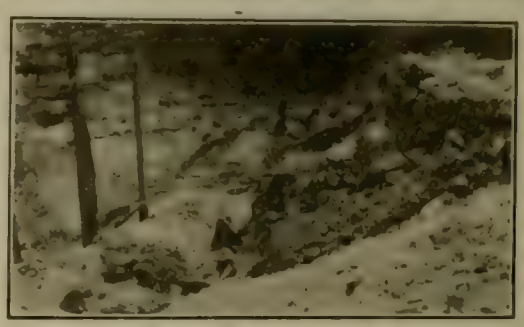
SIERRA COUNTY

(Special Correspondence).—The 20-stamp mill of the Sierra Buttes was started this week, and it is expected to have all 40 stamps in operation by fall. It is reported that a shoot of rich ore has just been opened. Jay C. Folsom is manager.——Paul W. Smith and J. G. Jackson, of Oakland, have obtained a bond and option on the Brown Bear group of gravel claims on St. Charles hill.——The 10-stamp mill of the Keystone has resumed. The lessees report considerable milling ore developed.——The vein at the Oak mine is being developed by an adit, which is in over 90 ft. on the shoot. The vein is 18 to 36 in. wide, and assays $20 to $30 per ton. The property was recently bonded by F. A. Gowing.——Development has been resumed at the Kate Hardy, under the direction of J. D. Beggs.——Work will be resumed at the Four Hills mine.——The Middle Yuba Hydro-Electric Co. is rapidly completing the installation of equipment at its mill station near Alleghany and expects soon to commence the delivery of electric power to the district. It is understood that electricity will be received from the plant of the Bay Counties Power Co. on the Middle Yuba completes its plant on the middle Yuba river.——The Hunch Mining & Milling Co. has struck a 2-ft. vein 485 ft. from the portal of the adit which assays $7.60 per ton.

Downieville, September 3.

TRINITY COUNTY

(Special Correspondence).—The contract for the installation of the Bonanza King power plant on the east fork of the Trinity river has been let and it is the intention of the management to have the work completed within the next six weeks. Operations will be resumed at the mine as soon as power is available.——A Butte company has had representatives examining the Davis group of claims on Ramshorn creek recently.——The Headlight 40-stamp mill and cyanide plant are nearly completed, all of the principal mill machinery being installed and eight of the thirteen cyanide tanks finished. Flume construction is well under way and power-plant construction begun. The aim is to have everything complete and running by



Removing Overburden by Sluicing.

November 1.——The Golden Jubilee has started a force of men on development.

Carrville, September 6.

TUOLUMNE COUNTY

(Special Correspondence).—Not in many years has the water supply in this county been as low as at present, the consequence being a compulsory suspension of operations, partly or entirely, at almost all the mines not equipped with electric or steam-power plants. In many of the mines development will be carried on with small crews throughout the dry season. The construction of a wagon-road into Knight's Creek district, which is becoming well known as a most promising mining region, is a probability of the near future. Packing on the backs of mules being the only means of transportation, the advancement of the district has been greatly retarded. Much mining machinery will be taken in as soon as transportation facilities are made better.——The machinery for a 10-stamp mill and a large electric motor have been delivered at the Duffield mine, near Arastraville. The work of erecting the necessary buildings has been commenced.——It is said that ore assaying over $100 per ton is being extracted from the Hazel Dell for shipment to Selby. The vein is 3½ ft. wide. An ore-roasting plant is being installed.——The mine at Italian Camp, operated by Rolleri & Co., is being equipped with a 4-stamp mill. A sufficient supply of ore is ready for stoping to keep the mill in continuous operation for many months.——It is reported that a body of rich ore was uncovered in the Tarantula mine last week.——The old Ham & Barney mine is about to be re-opened.——The Springfield Tunnel & Development Co. is extracting and washing some rich gravel from its property at Springfield, and the outlook is good for a most prosperous future. Sixteen men are employed.

Tuolumne, September 6.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence).—A streak of ore has been uncovered on a vein parallel with the Virginia City on Lincoln mountain, that shows an assay value of 40 oz. gold per ton. The discovery was made by J. W. Crandall.——Ed. Stensen, of Denver, who recently purchased the Oriental group of claims, states that machinery will be purchased this fall.——John Hurley, leasing on the Helen-Herold property in the Daily district, has uncovered an 8-in. streak of ore that is worth 300 oz. silver and 5 oz. gold per ton. Shipments will start in two weeks.——Power drills are working in the breast of the Vidler adit in East Argentine. C. A. Fuller, the contractor, will complete the 2300 ft. of driving inside of eight months.——A rich discovery has been made in the heading of the Silver Plume adit on Leavenworth mountain.——Work was put under way this week in the development of the Ruler mine on Griffith mountain. The adit is to be driven for a long distance as a number of cross-veins are owned. N. Williams is manager.——E. Reihling, leasing on the Freighters' Friend, is stoping on a streak of ore two feet wide that mills $26 per ton in gold and silver.——The main shaft on the Avalanche mine at Freeland is to be sunk 100 ft. E. M. Moscript is owner.

Georgetown, September 3.

LAKE COUNTY

The work at present in the Birdella adit in Gleason gulch in the Leadville district is moving slowly on account of the heavy flow of water that is coming from the breast of the cross-cut which is being driven to tap the Amity shaft. The water in the shaft has already been lowered 15 ft.——The heavy flow of water in the Wolftone shaft is under control and the pumps are now handling 1500 gal. per minute. ——The water has been lowered to the 650-ft. point in the Helena and it is probable that development will be started at this point.——Miles Lee and associates who have a lease on the North Star No. 2 have cleaned out and retimbered the adit and are working on a streak of ore which was found in the face of the drift.——Robert Jones, leasing on the Robert E. Lee, is stoping on a large body of ore which he has opened on the lower levels, and is shipping a lead-zinc product.——The shaft on the Clear Grit is down 120 ft.——Diamond-drilling has been resumed in the Hilltop mine.

OURAY COUNTY

Another rich vug has been opened on one of the Wanakah Mining Co.'s claims, and the ore is being sacked before sending to the mill. Over 100 tons have been shipped from the vug that was opened a short time ago, assays of over $100 per ton being obtained.

TELLER COUNTY

The School Section Leasing Co., operating on Bull hill in the Cripple Creek district, has been shipping a carload of ore per day since the first of the month. The ore is coming from the fifth level and there is enough broken to keep up this rate for the next three months.——One of the best discoveries made in the district recently was that of Robert Edson, in the Findley mine, the coarse rock milling $40 per ton, and the screenings $90. The ore is between three and four feet wide.——The Jerry Johnson mill, on Ironclad hill, has been closed on account of the litigation between the Jerry Johnson company and Edwin Gaylord.

KANSAS

CHEROKEE COUNTY

(Special Correspondence).—In spite of the fact that a large surplus of ore has accumulated in the Galena camp awaiting a higher market, the mines are not closing, but many new prospects are being constantly opened and old mines resuming activity. Among the larger properties operating are the New Century, the Diplomat, the Abbey & Co., the James Murphy, and a number of small plants from 5 to 50 tons. The Diplomat has sunk to the 180-ft. level, a depth greater than hitherto worked on this land, and has found a fine run of ore of the typical boulder type. The mill is working on a dump pile which contains about 6000 tons of material, accumulated during the building of the mill.——The Wyandotte company has made one of the richest discoveries of recent date in the camp, having found ore which makes a recovery of 20%. Out of 400 tons mine run 90 tons of ore was secured. The deposit was struck at 50 ft. and occurs in a flint gangue with a large amount in the fine dirt distributed through the boulders. All the ore in sight is thought to run 20%. The company has also sold a lease of 20 lots to a large company on the west side of the land and this will be developed at once. This part of the land has yielded a large amount of ore from shallow gouges in the past but will be developed at the lower runs.——Another rich drill-hole has been recently completed by the Clermont company, in the southwest part of the camp. The ore was found at 225 ft. but was richest at a depth of 250 ft. with the drill still in ore at 276 ft. The work was stopped at 280 ft. Another hole will be drilled a short distance from this one. The hole first put down and completed a few weeks ago was almost identical with the second one just reported.——The New Century, the largest mill in Galena, is again operating, though only a part of the mill is used. The plant was originally a double structure. Two shafts are used to supply the mill and some ore is brought from other leases.——A drill-hole has been put down on the Glick land by J. C. Moore, and the drill entered ore at 72 ft. continuing in ore to 80 ft. The cuttings ran 10% and were higher grade than most of the ore taken from this land. Seven drill-holes have been sunk, five of which showed excellent ore while the other two showed only very thin seams and were called blanks. The best hole so far sunk showed a face 18 ft. thick.

Galena, September 3.

MISSOURI

JASPER COUNTY

(Special Correspondence).—Among the good discoveries recently is one by the Waneta company on West Seventh street, Joplin, where the drill passed through a rich run of ore at a depth of 127 to 137 ft. The ore ran 6% zinc. This mine has been worked for a number of years, at various depths, beginning at 70 ft. and afterward being deepened to 100 and later to 131 ft. The mines to the south of this property have been working at depths between 180 and 200 ft.; and additional prospecting will be carried on by the Waneta to discover ore at these lower levels.——The second drill-hole has been completed on the Brattleboro lease on Turkey creek, and has entered the same ore deposit which was reported in the first. The ore was struck at 63 ft. continuing in soft ground till 83 ft. when a hard limestone was entered. The ore is exceedingly rich, running 35% zinc in places and consists of the same quality as has been mined successfully in the Kalitan and Cardinal tracts adjoining.——Northwest of Webb City the second hole has been sunk by a party of Webb City and Joplin men, and has been successful in finding a fair run of ore from 164 to 194 ft. The first hole reported a few weeks ago was similar to the second.——The Granby company, which has undertaken development of its mining grounds in the Oronogo camp, has outlined a new plan by diverting the stream which flows through its land into a new channel to prevent constant flooding of the ground.——The drifts of the Oronogo Circle No. 3 which have hitherto been producers of the highest grade zinc ores, running less than 0.5% lead and bringing the highest market price, have recently completely changed from zinc to lead producers, and have thus vitiated the zinc ores while the lead value has increased remarkably. Two of the drifts show a complete lead face while the third contains much lead mixed with the zinc.——Among the new mills to be erected recently is the Muskingum plant on the west Joplin disseminated tract. It is a 250-ton plant brought from the Peacock district where it was used a short time. The lease consists of 20 acres of well developed mineral land, surrounded on three sides by good producers.

Joplin, September 3.

MONTANA

[illegible] COUNTY

(Special Correspondence.)—The Lexington Copper Co., Butte & Superior Copper Co., the Anaconda Copper Mining Co. and the Boston & Montana Development Co. are sinking a new shaft on the Lexington property, which is situated on the Continental divide, about 2 miles from Lexington station, on the Northern Pacific railroad. The shaft is down 400 ft. and ore is being encountered. It is the intention to sink the shaft to a depth of 1000 ft. and then drift to the east and west on the vein. The vein is 1000 ft. below the surface at the point where the shaft is being sunk. The vein is from 100 to 150 ft. wide. The ore is a mixture of zinc and lead. The Lexington Copper Co. has a lease on the property. The Butte & Superior Copper Co. has the contract to sink the shaft. The shaft starts on the south wall and cuts through the vein at a depth of 700 ft. Then [illegible] 1000 ft., which indicates the variation in the dip of the deposits. Development of the strike of the vein extends 600 ft. west and 300 ft. east of the shaft. It is expected that the greatest bodies of ore lie in that portion of the vein east of the shaft. The vein known as the Black Rock lode has an approximate width as reported of 200 ft. The ore occurring in lenticular bodies. These lenses have a width varying from 10 to 75 ft. and some of them have a length of 300 to 500 ft. The gangue consists of quartz and decomposed granite containing zinc sulphide with some iron, manganese, copper, lead, silver, and gold. The ore runs usually 20% zinc, 1 to 2% lead, 6 oz. silver, with traces only of copper and gold. The output of the mine is limited to the capacity of the concentrating plant at Basin, or that portion of it that is under lease to this company, 350 tons per day. Two concentrate products are made, the first and principal part assaying 54% zinc, 3% lead and manganese, and 14 oz. silver. This is shipped to the plant of the Bartlesville Zinc Co., in Oklahoma, controlled by the American Metal Co., the other product, containing 40% lead, 17% zinc, 10% iron, and 25 oz. silver, is marketed locally. The lead product amounts to 1¼ tons per day. On the whole, the concentration is at the rate of 3½ tons into 1 ton, the recovery of zinc reaches 70%. M. W. Atwater, superintendent for the company, states that the work of erecting and installing a concentrating plant of 1000 tons capacity at the mine will proceed this fall. The building will be of steel, and will house equipment for jig and table concentration, and for classifying, and settling the slime. There will be no magnetic machines, as the ore is low in iron. Four carloads of structural steel are now on the ground for the building. Hoisting is done by running the loaded cars into the cages, but this method is to be supplanted at once by using 3½ ton skips, there being two hoisting compartments for ore and one for a cage that carries men, timbers, and steel. There are two air compressors, one steam and one electric driven, having the capacity to operate 16 drills. The intention is to run the new mill by electric power.

Butte, September 3.

NEVADA

ESMERALDA COUNTY

Arrangements have been made with the management of the Goldfield Consolidated for the development and working of the shoot in the Vinegarone ground of the Jumbo Extension, as the ore has been opened in the Consolidated stopes to the boundaries of the Vinegarone claim. The workings on the Consolidated side of the line have produced over $2,000,000.——A shipment of 50 tons of ore assaying $35 to $40 per ton was forwarded recently from the Nevada Eagle mine to the sampler of the Western Ore Purchasing Co. The ore was mined on the 250-ft. level where a large tonnage has been opened. The ore nearer the surface was inclined to be erratic, the value depending on rich stringers, but with depth these have widened and the whole vein is now of fair grade.——Plans are being formulated for the reorganization of the Goldfield Daisy, and if carried through a new corporation will be formed to reopen the property.

HUMBOLDT COUNTY

The new machinery, consisting of a 15 hp. engine and a pump, for the Wild Bull Mining Co., in Wild Horse, has been forwarded from Lovelocks to the mine, where it will be installed in the course of a few days. The shaft, now down 265 ft., will be sunk to the 400-ft. level as soon as the installation is complete, and a cross-cut driven to the ore.

NYE COUNTY

[illegible] (Special Correspondence.)—E. D. Perrault has leased or [illegible] for the Peace Portion claim. The shaft is down 60 ft. and will be carried to the [illegible] ore was discovered on surface workings. A sample [illegible] the bottom of the shaft assays $4 per ton. The [illegible] of the New Bonnie Claire Co. will be started shortly. The spur line from the Las Vegas & Tonopah railroad to the gold properties is being rushed to completion. It is reported that work will be resumed within a short time at the Lucky Mac group. John Lindstrom is manager.——The lessees on the Diamond recently shipped a car of high grade ore to the Martinez plant of the Mountain Copper Co.——Vucovich & Gingles have received returns from a recent shipment of 30 tons of ore to the Needles smelter from their Denver lease on Tramp Consolidated. The ore averaged $49 per ton.——The Eclipse mill is running on ore from the Shively-Bennet lease on Tramp No. 5 claim. The ore assays $47 per ton.——The management of the Johnnie Consolidated mines has decided to sink the 800-ft. incline shaft to a depth of 1000 ft. from which north and south drifts will be extended. It is also planned to sink a new shaft, 3000 ft. south of the present workings, increase the capacity of the mill from 75 to 100 tons per day, and erect a power plant at Amargosa station. The new shaft will probably be vertical and 600 ft. deep.——The shaft of the Mizpah Extension has reached the 900-ft. point and will be continued to the 1000-ft. level before lateral work is undertaken. The formation has grown harder, rendering sinking more difficult.

A foot wall cross-cut has been started from the 500-ft. level of Tonopah Extension to open the orebodies developed in the west part of the 400-ft. level.

Rhyolite, September 2.

STOREY COUNTY

Assays of $82.50 have been obtained from the face of the drift started a short time ago on a stringer intersected by the east cross-cut of the Mexican mine, the vein having widened to 8 in. Shipments of 50 tons per day are being maintained.——Rich ground is also being opened in the Ophir, 37 mine cars being hoisted that assayed $141.71 per ton.——Cross-cut No. 2 on the 1200-ft. level of the Overman has been cleaned up and work resumed in the face.——Mining in Sixmile canyon is progressing satisfactorily. The Comstock Phoenix at the north end of the Brunswick lode is shipping steadily to the Butters mill though no stoping is being done, the ore coming entirely from development. Repairs have been made to the aerial tram of the Butters company.

WHITE PINE COUNTY

A new Cameron No. 9 pump has been ordered for the Zack shaft of the Ely Consolidated Copper Co., and sinking will be continued. A large tonnage of ore assaying 5 to 7% copper has been blocked out in the upper levels and lateral work will be started from the shaft to develop this at depth as soon as the pump is in position.——It is reported that Salt Lake interests have secured an option for $25,000 on the Gold Coin group which joins the holdings of the Nevada Consolidated.——R. H. Richardson and John Eager have secured a bond on several claims in the Patterson district which are supposed to contain valuable gold and tungsten ore. Samples have been taken and work will be started on the property if the assays prove as rich as expected.——Machinery is being forwarded from Ely to the Hub properties where work has commenced on the mill. Construction is under the supervision of E. L. Fletcher.——Nickerson & Johnson shipped a car of lead-silver ore from the Elijah mine, near Lane City, which they are working under lease. The ore was sent to the American Smelting & Refining plant and is valued at $30 per ton.——O. H. Paulson, who re-located the old Ruby Hill group about a year ago, has obtained samples from the property that assay several thousand ounces of silver per ton. The group is in the Schell Creek district about forty miles from Ely, and was opened in early days when a large amount of high grade ore was shipped.

UTAH

BEAVER COUNTY

A mill and cyanide annex that will treat 20 tons of ore per day is to be erected at the Rob Roy property on Indian creek, the controlling interest of which is held by P. T. Farnsworth, who has been directing the development for some time. A new shaft has been started across the creek which will be sunk on the vein. Work is to be resumd shortly on the Busy Bee ground which adjoins the Rob Roy.

JUAB COUNTY

Work has been started at the Black Jack mine in the Tintic district, a contract having been let for 200 ft. of driving. This work will be directed toward the Opohongo ground where the Opohongo shoot is supposed to enter the Black Jack property.——The shaft at the Victoria was sunk 130 ft. the past month, giving a total of 750 ft. The work is progressing in a satisfactory manner and it is expected that the objective point, the 1000-ft. level, will be reached within the next two months.——A pocket has been cut at the 650-ft. level of the Dragon shaft and sinking has been resumed. About 30 carloads of ore per week is being shipped from the mine.——New equipment has been purchased for the Crown Point and will be installed at an early date. A new shaft 1300 ft. east of the Colorado No. 2 shaft has been started.——At the Eagle & Blue Bell 239 ft. of the new shaft was cut during August, and it is expected to complete the remaining 200 ft. by the end of this month, making connection with the 1000-ft. level and giving the company excellent ventilation. The new hoist will be started as soon as the connection is made.——The Bullock Mining Co. has levied an assessment of 1c. per share on its outstanding stock which becomes delinquent October 1 with the date of sale set at October 18.——Work has been started through the Iron Blossom 500 and 600-ft. levels developing the adjoining Governor property into which the Iron Blossom orebodies extend.

SUMMIT COUNTY

The long adit of the Silver King Coalition Mines Co. has been straightened and electric wires for power haulage strung. It is reported that a new shoot of galena three feet wide has been opened on the 1200 and 1300-ft. levels of the mine.——H. M. Crowther and associates have secured another long lease on portions of the old Ontario mine, and are preparing to increase the working force at the property. ——Joseph M. Howells is at the head of a new company which has been formed to absorb the Park City Mines & Power Co. owning the Baby McKee group in the Cottonwood district. Rich ore has been blocked out in the property and shipments will be started at once.——Over 1100 ft. of the Snake Creek-Daly-Judge tunnel has been completed during the past three months though a slight delay was caused a few weeks ago through the late delivery of air-pipe.—— The fissure on the 800-ft. level of the New York is reported to be improving, a number of rich pockets of ore having been opened recently.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—Work has been resumed on the Blue Bird mine in the south belt of the Rossland district. A small force has been started on development and results have been gratifying. One assay taken from a recently opened deposit showed 2 oz. gold, 10 oz. silver, and 5% lead per ton. Considerable concentrating ore is being mined and placed on the dump.——The Le Roi Mining Co., which has gone into voluntary liquidation, is said to be practically free from debt. There is no mortgage against any of the company's property and no debentures have been issued. Last year the company borrowed $77,760 and expended $145,800 since the reopening of the mine, part of which sum was derived from the sale of ore. Of the amount borrowed, $77,760, $24,300 has already been paid and there is about $38,000 cash on hand and owing the company by the smelters and others, leaving a difference of $14,660. This company has done 27,000 ft. of diamond-drill exploratory work since June, 1906; 15,000 ft. of this having been done during the last 12 months. The last of the known pay-ore is being taken out of the mine and will be realized upon. It is estimated that it would take approximately $500,000 to effectively explore the Le Roi ground for more ore of the better grade. There is a lot of second-class ore still in the stopes of the mine, which is considered a valuable asset.——It is stated that arrangements are being made by the Ymir Gold Mines, Ltd. to sink 500 ft., or more, on the main vein, from the tenth level.——In a recent statement William Templeton, the Minister of Mines, made it known that one of the best zinc experts in the world was at present gathering data relative to electric-zinc smelting in those countries where it is now practised, with a view to perfecting a system for the treatment of Kootenay zinc ores. All possible information will be secured and laboratory tests made at Ottawa, and when the scheme has been advanced to a commercial stage the final tests will be made at the electro-thermal smelter at Nelson. The $50,000 recently appropriated for this purpose is being used with care and it is hoped that a successful method of treating the local zinc ores will be the outcome.

Rossland, September 3.

ONTARIO

The Temiskaming & Hudson Bay Mining Co. paid dividend No. 27, August 27, amounting to $23,263 or 300% on the issued stock. The company is erecting a new mill, the fourteenth in the camp of Cobalt, and has the foundations well under way, with the machinery ordered.——From 30 to 40 tons of ore per day are being run through the concentrator at the Savage property, and five drills kept in operation underground. Practically all the work is confined to the 80-ft. level, although the main shaft is down 140 ft., with two veins opened that vary between one and two inches in width and assay 1200 to 1500 oz. silver per ton.——The Harris Lorrain Syndicate has opened a promising vein of calcite containing smaltite and nicolite in trench No. 1 on its property in the South Lorrain district.——Two new orebodies have been cut underground in the Beaver mine which assay about 5000 oz. silver per ton and greatly add to the company's ore reserve. The first discovery was made by raising in an old stope on the 200-ft. level and the second in the cross-cut on the 300.——A four-foot vein has been uncovered several hundred feet on the claims of James Hylands at Porcupine, and a two-stamp mill is to be erected on the property.

MEXICO

CHIHUAHUA

D. W. Shanks, general manager for the Rio Plata Mining Co., who has been in New York recently, stated that the property which is in the Arteaga district was in excellent condition. About 1200 ft. of drifts have been driven since January 1 on the vein of silver ore. A new tube-mill has been installed and the company is treating ore that assays as low as 17 oz. per ton silver. A shipment of 52 bars of bullion containing 58,000 oz. silver has been recently forwarded to Chihuahua.

PHILIPPINES

The mill at the Mauricio mine in the Paracale district started the latter part of August, the tram line to handle fuel having been completed. An ample supply of fuel and water has been provided for and a great deal of interest is taken in the property as it has been one of the pioneers of the district and its success means much to the surrounding country.——The shaft at the Tumbaga is nearing the second level and it is expected that the station at the 200-ft. point will be cut this month and the drifts well along on the vein by the next.——The Ragay Gulf Exploration Co. has been incorporated to develop a number of copper claims and a large area of dredging ground.——There are now three dredges operating in the Paracale district and if the plans of the operating companies are carried out there will be two or three more at work before the end of the year.

Universities and Mining Schools

D. Dale Cossitt has been appointed assistant in geology for the ensuing year in Columbia University.

University of Wisconsin senior mining students spent six weeks during the past summer at the Butte camp. The course included surveying, mapping of local geology and underground work.

Clinton R. Stauffer has been appointed assistant professor of geology in Queen's University, Kingston, Ontario. This position carries with it an appointment on the Canadian Geological Survey.

The American Society of Engineering Contractors will hold its annual convention at the Coliseum, St. Louis, Missouri, September 27, 28, and 29. D. J. Hauer, 13-21 Park Row, New York City, is secretary of this Society.

Frank Kolster, in a paper presented before the recent Convention of the Society for the Promotion of Engineering Education, held at Madison, Wisconsin, discussed in detail the educational system of the German technical universities.

The University of Chicago included in its summer courses a number of lectures on conservation. The speakers included C. W. Hayes, chief geologist of the United States Geological Survey; Frederick H. Newell, director of the Reclamation Service, and Henry S. Graves, chief forester.

The bulletin of the Lewis Institute has been issued. It contains the announcement of courses, lists of students and officials, and general information. The work is divided into three main parts: engineering and the mechanic arts, domestic economy, and liberal arts. The regular course covers a period of four years and the autumn quarter commences September 26.

The June issue of the quarterly bulletin of the University of Missouri School of Mines and Metallurgy contains the commencement address delivered by Charles Sumner Howe June 1. Mr. Howe, who is president of the Case School of Applied Science, spoke on the success that has to do with individual traits, and the success that is concerned with the highest good to the Nation at large.

At the University of California an association has been formed by the professors and students under the direction of F. G. Cottrell, for the study of the smelter-fume problem. Data regarding the removal of injurious substances from the smoke and the commercial disposition of the by-products will be collected, and experimental work carried on in the laboratories. In the work of determining the availability of the by-products as sterilizing and fertilizing agents to the soil the College of Agriculture will assist, with the College of Mining contributing to the metallurgical side.

The Michigan College of Mines, at Houghton, has issued its 'Year Book for 1909-1910,' 'Views of the Michigan College of Mines,' and a list of its graduates. The Year Book contains the announcement of courses for 1910-1911, lists of the faculty, students, and accredited schools, requirements for admission, costs of living, regulations, prizes, and scholarships. In addition to these, maps of the campus, Portage Lake mining district, and the mineral district of northern Michigan have been included. The views of the college show the buildings, laboratories, and field courses taken by the students. The list of graduates contains the names of 522 former students with their records and addresses. The term opens September 30.

In keeping with its progress in welfare work, the Dodge Manufacturing Co. has just opened to employees of the big plant at Mishawaka, Indiana, an athletic field fully equipped for tennis, croquet, quoits, bowling on the green, and horse shoes. Surrounding the field is a system of tungsten drop lights affording facilities for indulging in the various sports after dark. It is pleasant to see this evidence of co-operation between employers and employees.

Personal

Professional men are invited to send notes of their engagements and travels. Such news is interesting to friends.

Philip N. Moore is in San Francisco.

Courtenay De Kalb is at El Cobre, Mexico.

James M. Nixon was in Zacatecas last week.

Lewis Bailey has returned to Spokane from Judith Basin, Montana.

George A. Packard is making Butte, Montana, his temporary headquarters.

T. Lane Carter, of Chicago, is on a professional trip through Kansas and Missouri.

Arthur Burch leaves San Francisco today for a month's work in British Columbia and Alaska.

S. E. Rounds has returned to the Fremont Con. Mines at Drytown, California, from Costa Rica.

J. W. Astley has resigned as consulting engineer for the Peterson Lake Mining Co., at Cobalt, Ontario.

Hallett R. Robbins, of Seattle, is examining mining properties in the neighborhood of Haines, Alaska.

E. H. MacDonald, field geologist for the Northern Pacific Railway Co., spent a month in the regions tributary to Pierce and Elk City, Idaho.

Arthur W. Jenks sailed from London, August 19, to take his position as resident manager of the Famatina Development Corporation, Ltd., Chilecitos, Argentine Republic.

W. Weston has resigned as chief of the mining and industrial department of the D. N. W. & P. R. R., and opened an office in the Gas & Electric building, Denver, Colorado, for consulting work in mining and industrial engineering.

The San Francisco Section of the Mining & Metallurgical Society met following dinner at the Palace Hotel, September 5. The following members and guests were present: S. B. Christy, F. W. Bradley, M. L. Requa, C. W. Merrill, W. S. Noyes, A. C. Lawson, Albert Burch, Francis Drake, H. F. Bain, Stuart Rawlings, Charles Janin, Howard D. Smith, E. H. Garthwaite, Sumner S. Smith, F. G. Cottrell, William M. Rees.

VOGELSTEIN TIN CIRCULAR

The statistics of tin stocks are disappointing to those who expected to find in them some reason for the recent advance. They are quite commonplace, showing only the normal shrinkage of the visible supply usually witnessed in a non-Banca sale month, about 1000 tons, bringing the total stock landed and afloat to approximately 16,500 tons. Straits shipments are liberal, 5400 to 5500 tons, about 700 tons larger than the same month last year, but for the eight months there is still a deficit of nearly 2000 tons from this source. European deliveries show no striking change. The most notable development is the continued increase in U. S. deliveries, which now amount to 4300 tons more than last year. There has, however, undoubtedly been a record-breaking actual consumption of the metal. The question now is as to whether consumption may be expected to continue on the same scale. As to the future it seems safe to assume that deliveries will be good during the next month or two, but that thereafter some falling off may be expected in harmony with the curtailment experienced in other lines of the metal trades.

L. Vogelstein & Co. give the following figures of German consumption of foreign copper for the months January to July, 1910:

	Tons.
Imports of copper	100,150
Exports of copper	5,058
Consumption of copper	95,092

as compared with consumption during the same period in 1909 of 90,168 tons. Of the above quantity 86,684 tons were imported from the United States.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

EFFECT OF PERFECTED LOCATION

A perfected location of mineral land has the effect of a grant by the United States of the right of present and exclusive possession. Accordingly where a locator who claims under a prior notice of location, with the boundaries of his claims sufficiently marked, does the amount of required work on the claim and records a sufficient location certificate, any inchoate rights by a rival claimant under an attempted subsequent location of the same claim thereby comes to an end and will not be revived by an subsequent forfeiture or abandonment of a senior location.

Bergquist *v.* W. Virginia-Wyoming Copper Co., (Wyo.) 106 Pac., 673, Feb. '10.

INJURY TO MINER—SAFETY OF 'TRAVELING WAY'

A part of a mine in which a miner was working that was designed for a passage way when completed, but which was only partly completed, was not a 'traveling way' within the meaning of the Colorado statute which requires mining companies to timber such. But it was the duty of the mine owner and operator to furnish the necessary timbers to support the roof and his duty to exercise ordinary care to furnish a reasonably safe place for the miner to work, and the miner only assumed the risk of those dangers which are known to him or which are plainly observable. He has a right to assume that the master has performed his duty and it is not incumbent upon him to discover unknown dangers which are not plainly observable.

Baldi *v.* Cedar Hill Coal & Coke Co., 173 Fed. 781.

EMINENT DOMAIN—OBTAINING IRON DEPOSITS FROM A PUBLIC CEMETERY

The fact that private parties were interested in securing the vacation of an old cemetery in order that the ground might be mined for iron, and the fact that they agreed to bear the expense of moving the bodies and the monuments to a new cemetery provided by the iron company did not affect the question of the necessity of appropriating the land sought to be acquired under regular condemnation proceedings.

McDonald *v.* Marquette Circuit Judge (Mich.) 123 Northwest. 112, Dec. '09.

INJURY TO PERSONS SEEKING EMPLOYMENT IN A MINE

A person applied to a pit-boss for a position to work in a mine, and was requested by the boss to return on a subsequent day. Pursuant to the request at a later day and on application on the office was directed by the superintendent to the pit-boss as the person who knew when men were needed, and thereupon went to the tipple of the mine to see the pit-boss, and while there was injured by an explosion which occurred in the mine. On this state of facts it was held by the Supreme Court of Michigan that whether such injured person was there on express or implied invitation was a question which must be submitted to a jury and could not be determined as a matter of law.

Schmidt *v.* Michigan Coal & Mining Co., (Mich.) 123 Northwest. 1122, Dec. '09.

RIGHT OF TENANT TO OPEN AND WORK MINE

A tenant by the courtesy has no right to open and work a coal mine which was unopened and unmined at the time of the death of his wife, though, as coal in place is held to be land, he has a life estate in it with which estate the remainderman cannot interfere. And where such tenant by the courtesy and the remainderman together sold all their interest in the land, including the unopened and unused mine, the proceeds stood in the place of the land and the tenant by the courtesy was entitled to the entire income during his life.

Deffenbaugh *v.* Hess, (Pa.) 74 Atl. 608.

Book Reviews

Any of the books noticed in this column are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

OUTLINES OF GEOLOGIC HISTORY. By Bailey Willis and R. D. Salisbury. 8vo. Pp. 306, Ill. University of Chicago Press, 1910. Price $1.50.

This book includes a series of essays involving a discussion of geologic correlation presented before Section E of the American Association of the Advancement of Science at Baltimore, December, 1908. The symposium was organized by Mr. Willis and the book has been compiled and edited by Mr. Salisbury. The contributors include many of the leaders of American geological work and the symposium was the most comprehensive attempt to summarize the known facts relating to the geologic history of North America since the publication of the well known correlation essays of the U. S. Geological Survey nearly twenty years ago. It is an especially welcome addition to the library, particularly of those who wish to know the recent interpretations of American geology but who have neither the time nor facilities for consulting original sources. It is compact, authoritative, and up to date. It is to be regretted that more of the discussion of these interesting papers was not included so that certain divergent views might also be presented. The most important omission, however, was that of a summary chapter by either or both the authors. The non-professional reader in particular would have been greatly helped by such a chapter, which both Mr. Willis and Mr. Salisbury are so well qualified to prepare. None the less the book is an important and most serviceable contribution.

A MANUAL FOR ASSAYERS AND CHEMISTS. By W. H. Seamon. Pp. 255, index. John Wiley & Sons, New York, 1910. Price $2.50.

It goes, almost without the saying, that this work of Mr. Seamon's is one well worth while. The author says in his preface that the book is principally for students and young graduates of mining schools, brought face to face with problems which ordinarily can only be solved after many years of experience. In addition to the well known standard methods, the author has added several which are distinctly original with him—methods which bring results. Mr. Seamon was for several years director of the State School of Mines at Rolla, Missouri, and at another period, president of the School of Mines, at Socorro, New Mexico, and was later the founder of the well known Seamon Assay Co., at El Paso, Texas. He has in recent years been established at Chihuahua, Mexico.

MINES OF RHODESIA. By Owen Letcher. Mining editor *South African Mining Journal*. Pp. 452, Ill., index. *South African Mining Journal*, Johannesburg, publishers.

This volume contains much of value to all interested in the development of Rhodesia, in whatever field. It treats of the geology of the region; the mining laws; the various mining divisions and mines, and their rapidly progressing development; together with a great deal of information for the use of settlers, with chapters on educational advantages, cattle raising, and agricultural possibilities, and with reliable statistical information. Several maps accompany the book which are a valuable aid in reading its contents. It is a much needed volume and will be heartily welcomed.

SEWERAGE. By A. Prescott Folwell. 8vo. Pp. x + 506, Ill., index. John Wiley & Sons, New York, 1910. Price $3.

A new, sixth, edition of this well known and standard text is now available. Important additions have been made and the entire text as relates to theory and practice has been brought up to date. Designing and construction methods, specifications, and the use of concrete in sewerage works is treated with especial fullness. The book will be useful not only as a class text book but for general reference.

Market Reports

LOCAL METAL PRICES

San Francisco, September 8

Antimony	12 --	Quicksilver flask	47
Electrolytic Copper	13½ - 13¾c	Spelter	5 - 5½c
Pig Lead	4.70 - 4.80	Tin	37½ - 38

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead	Spelter	Silver per oz
Sept. 1	12.50	4.40	5.20	52
" 2	12.50	4.40	5.25	52
" 3	12.50	4.40	5.25	52¼
" 4	Sunday	No market		
" 5	Holiday	No market		
" 6	12.50	4.40	5.20	52
" 7	12.50	4.40	5.20	52

ANGLO-AMERICAN SHARES

Cabled from London

	Aug. 31 £ s. d.	Sept. 8 £ s. d.
Camp Bird	1 9 1½	1 11 9
El Oro	1 6 9	1 6 9
Esperanza	2 15 7½	2 13 3
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 3	0 6 3
Mexico Mines	8 17 6	9 5 0
Tomboy	0 16 3	0 15 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Sept. 6.		Closing prices Sept. 8
Adventure	6	Mohawk	47⅝
Allouez	42	North Butte	29½
Atlantic	6	Old Dominion	36
Calumet & Arizona	58	Osceola	125
Calumet & Hecla	550	Parrot	13
Centennial	16	Santa Fe	1⅛
Copper Range	65⅛	Shannon	9¾
Daly West	6	Superior & Pittsburg	11⅝
Franklin	10¼	Tamarack	65
Granby	32	Trinity	6
Greene-Cananea, ctf.	6¼	Utah Con	23
Isle-Royale	18½	Victoria	2⅜
La Salle	10	Winona	7½
Mass Copper	7¼	Wolverine	120

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Sept. 8.		Closing prices Sept. 8.
Amalgamated Copper	63½	Miami Copper	18⅜
A. S. & R. Co	66⅝	Mines Co. of America	5/16
Braden Copper	3½	Montgomery-Shoshone	⅛
B. C. Copper Co.	4⅝	Nevada Con	20⅛
Butte Coalition	17⅞	Nevada Utah	⅜
Chino	15	Nipissing	10¼
Davis Daly	1½	Ohio Copper	1⅞
Dolores	5⅜	Ray Central	2¼
El Rayo	3¼	Ray Con	18⅛
Ely Central	7/16	South Utah	1¾
First National	3⅝	Superior & Pittsburg	12
Giroux	6½	Tenn. Copper	25⅛
Guanajuato Con	¾	Trinity	6
Inspiration	7⅞	Tuolumne Copper	2¼
Kerr Lake	6⅛	United Copper	6½
La Rose	3⅝	Utah Copper	46⅞
Mason Valley	7⅞	Yukon Gold	3¼

SOUTHERN NEVADA STOCKS.

San Francisco, September 8.

Atlanta	$ 13	Mayflower	$ 4
Belmont	4.06	Midway	23
Booth	11	Montana Tonopah	87
Columbia Mtn	6	Nevada Hills	2.25
Combination Fraction	41	Pittsburg Silver Peak	49
Daisy	4	Rawhide Coalition	11
Fairview Eagle	40	Rawhide Queen	25
Florence	2.30	Round Mountain	47
Goldfield Con	8.25	Sandstorm	8
Gold Kewenas	9	Silver Pick	7
Great Bend	3	St. Ives	18
Jim Butler	30	Tonopah Extension	90
Jumbo Extension	41	Tonopah of Nevada	8.50
MacNamara	30	West End	61

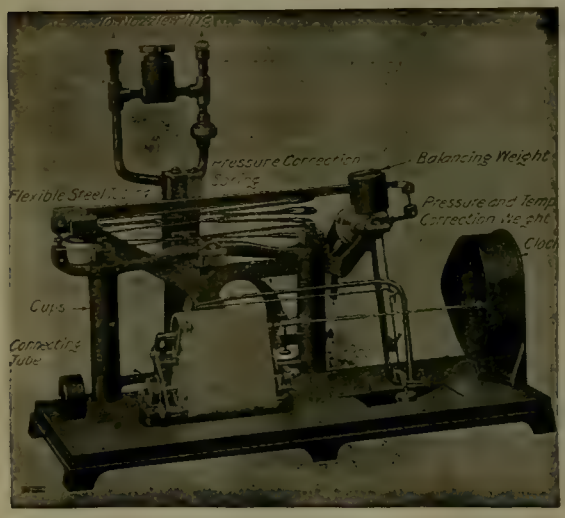
(By courtesy of San Francisco Stock Exchange.)

The Prospector

[illegible] department makes a charge of 25 cents [illegible] [illegible] [illegible]

A STEAM AND AIR FLOW METER

Over a hundred years have passed since James Watt perfected a steam engine with practical operating qualities, yet up to the present time the engineer has had no means of knowing how much steam was being delivered to the prime mover—how much utilized, how much wasted. The engineers of the General Electric Co. became impressed over four years ago with the fact that a means of doing away with guess-work in handling steam would be a wonderful boon to the engineering world. Experiments were undertaken with a view to perfecting a practical steam-meter, and as a result of over a thousand actual tests such an instrument is now on the market. There



Recording Steam Flow Meter, Showing Automatic Pressure Correction Device.

have been developed a recording steam flow meter, two types of indicating steam flow meters and an indicating air flow meter, each of which will accurately measure the rate of flow of steam, air, or other gases, in any size pipe, under any conditions of pressure and temperature met in commercial practice. The principle governing the action of the flow meter is a modification of that of the Pitot tube. A brass nozzle plug, screwed into the pipe at the point where the flow is to be measured carries two sets of openings: a lead-

Nozzle Plug.

ing set, facing the direction of flow and extending diametrically across the pipe; and a trailing set, consisting of two openings at 90°, and one at 180°, to the direction of flow. The impingement of the steam against the leading openings sets up in them a pressure equal to the static pressure plus the pressure due to the velocity head, while the trailing set is acted on by the static pressure less that due to the velocity. The difference is a measure of the velocity, and for constant temperature and pressure, gives the rate of flow. The pressures existing in the two sets of openings are communicated through separate longitudinal tubes to the outer end of the plug and from there by ¼-in. iron pipes to the meter.

The recording steam flow meter, Type R, form D, is a curve drawing instrument, accurately calibrated to record the total rate of steam flow in pounds per hour. In this meter there are two cylindrical hollow cups filled to about half their height with mercury and joined together at the bottom by a hollow tube. This U tube is supported on and free to move as a balance about, a set of knife edges. The two pressures obtained by the nozzle plug are communicated to the cups by flexible steel tubing, whereupon the difference in pressure is equalized by a rising of mercury in the left-hand cup and a falling in the right-hand cup. Because of the displacement of the mercury, the beam carrying the cups tilts on the knife edges until the moment of the counter weights on the extreme right of the meter exactly balances the movement caused by the displacement of the mercury in the left-hand cup. The motion of the beam is multiplied by levers and is registered by a pen. The time element of the meter consists of an eight-day clock driving a drum and feeding paper at the rate of one inch per hour. Charts are supplied in sizes to measure a flow of from 2000 to 240,000 lb. per hour, and of sufficient length to last one month. The rate of flow can be read at any instant or the average rate of flow calculated for a given time.

A NEW CRUSHER

The long felt demand for a crusher which will not only successfully crush but grind in the same operation is claimed to have been filled by the 3-B Eureka Crusher manufactured by the Eureka Stone & Ore Crusher Co., Cedar Rapids, Iowa. This machine is of all steel construction, the base being a single open-hearth casting which gives the required rigidity and strength. It will resist the most severe crushing shock. The jaw plates are made of the highest grade of manganese steel and are made reversible so that the maximum of use may be obtained. The eccentric shaft which carries the weight of the movable pitman is turned from a single open-hearth, hand-forged, steel casting, the bearings being made extra large to prevent excessive heating. The best grade of babbitt metal is used throughout. There are only three bearings in the complete machine, thus cutting down the friction fully 50% and saving from 25 to 40% in power. This 3-B crusher will reduce from 3 to 4 tons per hour of 3-in. rock or ore to the fineness of sand. It requires approximately 12 to 15 hp. A hand wheel regulates the distance between the jaws so that the product can be had in any size from 2½ in. down to sand. It is not necessary to stop the machine to change the size of the product. The safety toggle-plate prevents possible breakage from the accidental dropping of a hammer between the crushing surfaces. The tensile strength of this toggle is measured against the base of the machine. Exclusive of bolts the crusher has only fourteen parts. It practically combines the work of two machines in one. The Eureka Stone & Ore Crusher Co. is distributing some literature describing this machine and fifteen others.

COMMERCIAL PARAGRAPHS

PARROTT & Co., San Francisco, has recently been appointed Pacific Coast representatives for the Insoloid Fuse Company.

THE GALIGHER MACHINERY CO., Salt Lake City, has recently received an order for 1500 Isbell vanners to be used in concentrating mills of the Ray Consolidated Copper Co., and the Chino Copper Co. It is said to be the largest single order for concentrating machines ever placed.

The WESTINGHOUSE ELECTRIC & MANUFACTURING Co. has recently received an order from the La Blanca & Anexas Mining Co. for 40 type MS motors to be used in the company's mill at Pachuca, Mexico. The motors ordered range in size from 5 hp. on the pulp thickeners to 75 hp. on the tube-mills.

THE GREAT WESTERN MACHINERY Co., Denver, advises that it has purchased and now has for sale all the machinery from the Bamberger De Lamar 500-ton cyanide mill at Caliente, Nevada. Among the items may be mentioned motors aggregating 1000 hp., in units of 5 to 100 hp., 75 tanks, 10 Chilean mills, Gates crushers, Blake crushers, several electric locomotives, 5 miles of light rail, 32 miles of pipe-line, and numerous small machines and tools.

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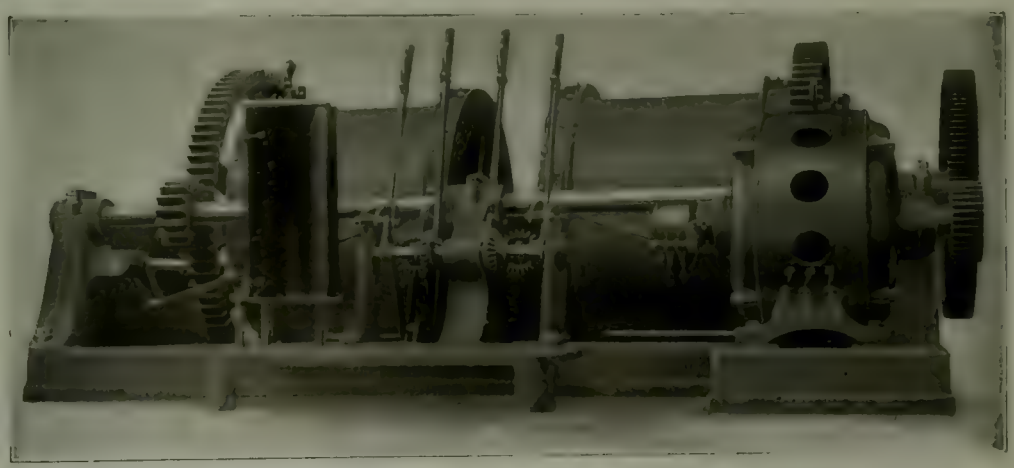

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EDITORIAL

ROBBERY of the safe on the steamer *Tanana* transporting bullion on the Yukon river, calls attention to the great sums of gold now regularly transported from Alaska to the States without loss. In the old days the fleet of treasure ships would have needed a corresponding fleet of battleships. Now robbery is only possible by connivance of some responsible official as is suspected in this instance.

ITALY is to be the host of the Tenth International Geographical Congress, which will assemble at Rome, October 15, and continue in session to and including the 22nd. Extensive preparations are being made to adequately entertain the delegates and reduced fares have been secured on railways and steamships. Commander Giovanni Roncagli, secretary of the Italian Geological Society, is acting as general secretary of the Congress.

COMPENSATION of employees for damages due to accident should be required in all industries. At present, settlement is by individual suit, and the companies pay heavy toll to indemnity insurance companies. The result in that the money paid does not go to the ones needing it and is economically a waste. It is doubtful whether the cost would be much if any greater if the system were changed and the burden of accidents and death placed on each industry instead of on society as a whole.

FOREST FIRES are now under control, but the lesson taught by them should not be forgotten. A most excellent suggestion has been made by Mr. George M. Cornwall, editor of *The Timberman*, to the effect that considerable bodies of troops be encamped each year from April to October in the forests so as to secure adequate patrol of the territory in danger. It would afford excellent experience for the soldiers and would prevent the start of conflagrations. The force of forest rangers is none too large for regular work and in the dry season is pitifully inadequate. The forests were saved this year by the soldiers, but the work of prevention would be both easier and more effective than that of stopping fires once started.

ADMINISTRATION proposals in the direction of conservation were formulated in certain bills introduced at the last session of the Senate by Mr. Knute Nelson of Minnesota. These bills are extremely important as giving at least the tentative ideas of Mr. Taft and his advisers as to constructive work to be undertaken. But two of the administration bills have been passed, one separating surface

and mineral titles in the case of coal land, and the other defining the power of the President in the matter of withdrawing public land from entry. The remaining bills are pending. A useful work has been done by the Colorado Chapter of the American Mining Congress in preparing and circulating abstracts of these bills. Copies of the abstract may be obtained from Mr. A. W. Warwick, 1510 Court Place, Denver, Colorado. They should be read by all mining men particularly.

ARIZONA has elected delegates to a constitutional convention and the work of drafting the fundamental law of the new State will soon be begun. Mr. James Bryce, some years since noted a growing disposition to put into constitutions all manner of provisions previously left for statutory enactment. This tendency has become more and more marked as State after State has since joined the Union. The disadvantage of this plan is that it necessitates frequent changes in the constitution and in many ways leads to light treatment of what should be regarded most seriously. The opposite extreme may be noted in Illinois where some forty years ago the constitution was revised by men who were so well satisfied with their work that they made it all but impossible to secure adoption of amendments; a result that has seriously hampered the State and its chief city. Whether a constitution should be merely a bill of rights and subject to little change, or whether it should include a multitude of matters and be easily altered, thus coming to approximate the 'living constitution' of Great Britain, is a matter much debated. The action of the Arizona convention will be watched with interest. The land is one of large and varied resources and the people are representative progressive Americans. How they provide for the future will not only indicate the trend of present opinion, but will mean much for the whole country.

BRIEF reports on mining stocks and properties are often desired by those whose interest is too small to warrant payment of an engineer's fee for examination. It frequently happens that sufficient data already exist to warrant the sort of report demanded by the contingencies of the case. Relatively few purchasers of mining stocks know where to get such data or how to interpret them when available. The *Mining and Scientific Press* is often importuned to furnish such reports for its readers and others. We have consistently refused to do so, holding that such work is outside the province of a technical paper. We pay much attention to our news service and publish each week all of the information regarding mines that is available and that we consider important and reliable. A regular reader of our news columns can keep well informed about any district, but we cannot undertake to make reports on particular properties. This is the province of the engineer, and the best engineers are listed in our professional directory. Unfortunately, possibly, engineers have never developed a system corresponding to that of physicians, of small fees for office consultations. This would not be easy to do, since in the case of the physician the patient is himself before the doctor, while in the supposed case of the mining engineer, the property to be examined cannot well be brought to his office. None the less we believe something of this sort is capable of development to advantage. Brokers, it is true, furnish reports to prospective customers, and many such reports are accurate and adequate. While in many cases there is no reason to suspect the sincerity of the broker or the honesty of the report, brokers' statements do not answer the demand. The element of self interest is involved and naturally causes the inquirer, justly or unjustly, to discount the statements made. An attempt is being made by a new concern called the Mines Report Bureau, to meet the particular demand outlined. The many difficulties in the way are obvious but the need is real. Intelligent and honest effort should go far to assume success, and certainly editors of mining journals will wish the projectors well.

Illinois Coal Miners Strike

Settlement of the strike of the coal miners in Illinois is announced, the men having gained an almost complete victory. The compromise negotiated by Mr. T. L. Lewis and characterized by Mr. John Mitchell as a better agreement than any other labor leader had ever been able to win in the coalfield, was swept aside in the special convention of the miners and Mr. John Walker and the Illinois officials sent back to make their own settlement with the operators. There was talk of an attempt to introduce non-union labor and of testing the constitutionality of the law requiring certificated miners. This law, while nominally a measure of safety enforced by the State, is actually a bar to the introduction of strike breakers and effectually enforces the labor monopoly enjoyed in Illinois by the United Mine Workers of America. To operate with non-union men in the face of as universal unionism as prevails in the Illinois field would be impracticable and unprofitable in any event, and the plan was wisely abandoned. In the meantime the fall season was rapidly approaching and an actual coal famine was threatened. It was not in human nature for the men to surrender after having won their hard fight at Indianapolis and when a considerable number of the operators had already accepted the Peoria terms. Trade was slipping away from the Illinois operators and reluctantly they have conceded defeat. Mr. A. J. Moorshead and his associates have made a gallant fight and on the whole the members of the Coal Operators' Association have stood together with unusual unanimity. In a field such as that in the Middle West where there are such large areas of coal so cheaply opened and when the variation in seasons produces recurrent periods of large demand and feverish activity in mining, it is inevitable that the lean months be overlooked and more collieries opened than actual market demand justifies. Many a small mine must run, regardless of final profit, or be shut down by foreclosure. Anti-monopoly laws preclude any arti-

ficial regulation of production by agreement among the operators. The consequent weak position of the operators is the main strength of the men and they have played on it with rare ability. The cost of coal mining has steadily risen; it has been impossible for the producing companies to raise their selling price in like degree. Competition with the cheaper mined coal in the South is the most important factor. Non-union labor and a lower standard of living among the men in West Virginia and other competing States, together with an advantage in the average better quality of coal, permits the output of the collieries there to be sold to advantage in territory naturally belonging to Illinois operators. It is an open secret that there has been but little profit in coal mining in the Middle West in the last decade, and conditions are undeniably bad. What the final outcome will be can not be foretold, but apparently some form of legal combination must be found. The trouble is that this is more likely to be brought about, under present laws, in the interest of the railroads than otherwise. No independent group is at once sufficiently interested and sufficiently wealthy to carry it through, and a combination backed by the railways would naturally operate to still further increase the difference in the price per ton paid by them and by other purchasers. As it is, the profits in coal mining in this field come mainly from the small portion of the product used by householders and manufacturers.

Thou Shalt Not Steal

This solemn mandate was laid down many years ago and is as binding now as at any period in history. Whether we regard it as a Divine command or the crystallization of the highest ethical judgment of mankind, it is equally the only possible rule of conduct for self-respecting men. It is short; and neither in itself nor in the context, is there any mention of exceptions. It applies to gold ore as it does to horses; a fact that the West has been inclined to overlook. We have too long forgotten the fundamental character of the precept. In the curious topsy turvy code of the West it has been too common to hang horse thieves and joke about 'high-grading.' The statement that at Goldfield there are two grades of ore, "high-grade and company ore," carried to thoughtful men a sting and a reproach as well as a glint of light-hearted humor. Mr. Waldemar Lindgren startled the community by estimating at one time that a million dollars worth of high-grade ore had been stolen in one year, and informed managers believe that he did not overstate the case. We are glad to believe that at Goldfield, at least, stealing has since decreased. We judge this both from direct statement of managers and from indirect evidence. Single retail merchants no longer sell to a miner's wife in excess of the total amount of her husband's wages, as was once done. One merchant who recently retired and left the district stated that in 1906-1907 he made a profit of $250,000, and frankly admitted that probably the bulk of his profit went back to stolen ore. We would not, however, hold up Goldfield alone to condemnation, indeed we believe that stealing ore in the more important mines, at least, of that district has largely stopped. Grass Valley in California is one of the most charming of mining towns. The neat white-painted, green-shuttered miner's homes surrounded by well kept gardens, with the blue sky, the yellow sunshine and the background of green pines, afford one of the most attractive pictures in any American mining community. Here, the visitor would say, is mining at its best, a community of industrious contented workmen and prosperous mines. In this same community, however, it is an open secret that ore stealing is constantly carried on. Despite specimen bosses and change rooms, the high grade ore steadily finds its way out of the camp through illicit channels. Cripple Creek in Colorado has been cursed since its birth by thievery. Much of the disregard of law that has disgraced the community and that has especially characterized the labor troubles of the district, can be traced to the presence of men to whom ore stealing is a joke instead of a crime. Men who steal ore regularly are and have always been numerous in the mines. The old crowd of union men were driven out, but the non-union men who took their places are no more honest in this particular if in any. It is the common practice to lay all the blame of these conditions on the men, and in truth the major load must rest there. A thief is a thief the world over, and whether he steal a handful of rich ore each day or break into a safe at night, is not material. It is equally true, however, that a man who knowingly or willingly buys stolen ore, or the banker who handles bullion he has reason to believe comes from stolen ore, is as much a 'fence' as though he bought in silver plate for which the burglar has risked his life and liberty. No community persistently and continually harbors thieves of any kind, except public opinion tacitly condones the crime. The prevalence of 'high-grading' in mining districts indicates a low state of morals. It will not do to say that it is a phase of development in unsettled districts. Old mining communities as well as young suffer from it. Neither is it a peculiarly American crime. In Mexico, at Cobalt in Canada, at Kalgoorlie in Australia, on the Rand, in Siberia, indeed wherever rich ore tempts the miner, there are men who become thieves. They are criminals, and the community that tolerates them is no better, so far, than the outlaw camps of horse thieves that have been hunted off the plains. Under our present system of law and legal procedure it is all but impossible to secure conviction and punishment of 'high-graders.' There have been many proposals for change in the law to meet the case and in certain of the foreign districts unlawful possession of gold or silver is made a crime. Each man must account satisfactorily for any metal or rich ore found in his possession. This materially assists in protecting the mine owner, but this alone will not stop stealing. A better moral tone in mining communities is needed. There must be fewer euphomisms such as 'high-grader' and a sharp recognition of the fact that the man who steals ore is a thief.

Lessons From Gilpin County Practice

By George H. Cushing.

today may be in bonanza or shut down altogether tomorrow. This is a basic condition of the district—not necessarily a result of want of foresight or bad methods. In soft veins, the expense of opening upon a great extent of levels and raises may easily counterbalance the advantage of maintaining a steady output. Recent technical writings have emphasized the fact that unnecessary ore reserves lock up a great deal of capital, for interest on which part of every ton charged for the cost of extracting must. The characteristic ore occurrence in Gilpin county is a persistent vein, usually of greater vertical than horizontal extension, in a fissure zone. In these veins the payshoots are right cylinders, not unlike in vertical cross-section to pairs of inverted or partly inverted saucers. In most cases these veins were prospected on the surface and are intersected sometimes by great depths. The conditions, coupled with the laws in force at the time the mines were originally located and the local topography, has naturally resulted in the opening of a great number of small mines close together by means of underground shafts and, in many cases, four hundred feet deep. So that we have mines which are deeper than their length. At times they may be in operation, when they make a large production although the bottom workings will appear idle. At other times they may have been idle for a long period of time, during which they struggle along on what they call development, but which is supported more by some one's hopeful or frequently well-intentioned person. Looking at it broadly, this is not an economical method of working these mines. Its chief drawback is the necessity of keeping the producing properties of the mine working expensive, but necessary, levels in good ground and below the water. It is from this point of view that we see the necessity for the deep and expensive adits which are being driven to investigate and develop the Quartz Hill and Newhouse districts. The total tonnage of underground water is not great, as compared with that in many districts of Leadville or Cripple Creek. If we had to deal with only a few prospective workings, it would be possible to arrange for natural drainage through one of the natural opening drifts, but unfortunately such is not the condition. Most of the properties are owned by people who have no interest in operating them, and the leasing individuals or associations have to work of the utmost economy or cannot to make both ends meet. In my experience in Gilpin county, I recollect only one case of properly handling the water for the workings from one point, but this happened to be a case of there is considerable danger to water damage. The result has been that a few of the more active have managed to handle the water for an entire district. The property I refer to has always been underdeveloped, but as long as that mine is good and has a [illegible] etc. As soon [illegible] as each level refuse to accommodate [illegible] pumping the water charges caused by [illegible] advantage. This has been a difficulty [illegible] operating companies, and the cost of maintaining the pumping [illegible] has been found to increase [illegible] and [illegible] [illegible]

the constant expense of handling the regular incoming water, the aggregate cost has equalled a large percentage of the total output of the district. Therefore in computing the benefit to be derived from a system of natural drainage, it is not enough to figure what would be the expense of handling the inflow by a single, well-equipped plant at a central shaft, but also to consider the greater indirect expense of periodically unwatering mines after a time of idleness, and the advantage of having every mine kept open, so that further exploration is not handicapped by the great expense of unwatering before a stroke of work can be done toward the opening of new ground.

The most characteristic method of handling mine water in Gilpin county has been that of bailing with water-buckets. Where a shaft can be purposely set aside for a sufficient part of the time, and where the hoisting equipment is already available, this is probably the cheapest method of handling water from considerable depths. In this case, the water being usually acid, variable in quantity with the season, and the tonnage of ore to be hoisted rarely equal to the capacity of the shaft and plant, it is a specially commendable method. It results in a wet and disagreeable condition in the shafts, but as this tends to preserve the shaft timbers from decay, it may be really a benefit.

I might illustrate the relative cheapness of bailing and steam pumps by referring to an actual case in 1895. At that time the Gold Coin Co. was working rich ground in the Indiana mine, west of the Hidden Treasure shaft, and handling the water by steam pumps. The California plant was practically idle, and a contract was taken to handle the water by bailing at one-half what it was costing to pump. Nearly half of this was profit. The other method most commonly adopted was that of pumping with steam pumps. The losses due to condensation in long lines of unprotected steam pipes, the dry-rotting of shaft timbers with the moist heat, the destruction of water columns by the warm acid water, the necessity of making provision for pumps of far greater capacity than was required for the regularly coming water in order to handle the spring inflow, combined to make this system particularly expensive under the local conditions.

The third method was the Cornish pump which was installed at the Gunnell, Saratoga and Monmouth Kansas. In the first mine it was destroyed by fire; in the second, unwisely replaced by a steam pump; and in all three cases the necessity for pumping has been or is being removed by drainage through the Argo tunnel. Nevertheless the Cornish pump was eminently successful in Gilpin county, as elsewhere. The high relative cost of installation will doubtless militate against its further use in the district, except perhaps at some future time in the Briggs shaft of the Gregory vein, in connection with a comprehensive plan for the working of the Gregory-Bobtail group.

The final method to be considered is that which will probably be more and more generally adopted in future—the electrically-driven plunger pumps. Their freedom from most of the drawbacks of the steam pump, and, above all, the fact that they can be conveniently used to raise water to the level of the deep adits, will probably result in their general adoption to take care of the regular flow, supplemented by air-driven pumps or bailing in the spring months.

The 'Patch' and the Gilpin County Tramway.

The small and crooked shafts, following all the varying dips of the veins, have been much criticized, and every one who has tried to maintain a large output through one of them cannot but sympathize with the criticism. With the exception of the vertical Saratoga and Cook shafts, and the California shaft, inclined on the dip of the vein, I cannot recall a satisfactory deep shaft in the entire camp. But in this, as in so many other cases, 'to know all is to pardon all.' Gilpin County shafts mostly started out as prospect shafts, and followed the veins down. Probably, no doubt, they would have been better adapted for rapid hoisting had they been sunk parallel to the veins on the line of their average dip instead of in the veins themselves, and following every sinuosity. The trouble is that the dip of the veins is variable; some veins even completely reverse their dip more than once. Bearing in mind the legal condition—that most of the older and more important veins are covered by claims 50 ft. wide, and that the

right to the vein on its dip beyond the side lines depends on following it down from the apex—it is easy to understand why the shafts became crooked. For similar reasons the use of buckets instead of skips is general in the district. Nor is the bucket markedly inferior; except that, used without guides, it limits the hoisting speed. For small tonnages, and levels which do not extend far from the hoisting shaft, the Gilpin County plan of using two or three buckets and a trolley in the drift, unhooking the empty bucket and replacing it by the filled one, is one of the most economical methods of hoisting. For a large tonnage and longer trams, the use of low narrow cars, dumping by a tipple into pockets at the shaft, and filling from the shaft-pockets into a bucket, is similar to and nearly as economical as the best modern practice of loading into skips. The less satisfactory plan of using a cage was adopted at the Cook and Saratoga, but can hardly be regarded as a distinctively Gilpin County method.

Until about ten years ago, mining in the district was largely done either by tributing or on contract. We used to contract drifts, raises, winzes, and shafts at so much per linear foot, and stopes at so much per superficial square fathom. I doubt whether anything has done more to injure the prosperity of Gilpin County mining than the virtual abandonment of contract work, which has resulted in a marked decrease in the average efficiency of labor, and a corresponding increase in the cost of mining. There has been some advance in the standard daily wage, but this has not been equal to the increase in the cost of living, and has had relatively little influence on the increase of costs, compared with the lessened proportion of piece-work.

Contract prices for driving levels varied from $3 to $8 per linear foot; raises up to 100 ft. high about the same; in each case labor and materials for breaking ground, loading and tramming the broken dirt to the shaft, when not over three or four hundred feet distant, were included. Shaft sinking cost from $8 to $20 per foot including breaking ground, loading dirt, and setting shaft timbers. Stoping cost from $7 to $18 per square fathom of vein, and was mostly done on what is now called the 'shrinkage' system. Under this system, I believe, costs were as low as anywhere in the world under similar conditions. Needless to say, in contract stoping the closest supervision was necessary, to avoid either leaving large slabs of ore on the wall or breaking unnecessary waste with the ore. When high-grade smelting ore was found, necessitating special care in stripping and breaking down, the contract system was not applied, as the danger of losing ore became of greater importance than a small extra cost. When the entire vein was to be stripped and separately broken down, especially when adjacent to a soft 'shooting-course,' contract stoping was found to work well.

As a whole, the method requires more intelligent, if less constant, supervision than day's pay. It is probable that its abandonment was largely caused by the prejudice against it of bull-headed bosses and superintendents who disliked the worry it involves. Foremen, in particular, frequently oppose contracting because through it they lose the privilege of picking their men, and so favoring their friends, or in other and more innocent ways proclaiming their personal importance. Another thing which has tended to discredit the contract system is the shortsighted policy of some managers, who no sooner see contractors earning more than the standard wage of the district than they begin to cut the prices at which contracts are offered. This is a suicidal policy, for it disheartens the men, leads them to play foxy instead of using their utmost endeavors, and nullifies the essential object of the system—to provide an incentive for better work. Really, this policy usually arises out of ignorance. Such a manager does not know the value of the work, and looks only to the wage earned. The manager who cuts prices, directly high wages are earned, is doing as much to discredit the system as the unions who forbid their members to take contracts, unless guaranteed standard day's pay in any event.

The greatest benefit derived from piece-work is the improvement it effects in the quality of labor. Human nature being what it is, few men will continuously give the best that is in them without a special incentive. Why should a man work specially hard, or exercise his wits for the benefit of his employers, unless he reaps a direct reward for doing so? The day's pay system, which places all men of a class on one dead level as to pay, tends to reduce their work to a similar dead level; and as it is certain that the lazier or less skillful men can not or will not raise their standard of performance, it naturally results that the better men tend to reduce theirs to the level of the rest. It is useless to assert, as so many do, that a good foreman knows how much a competent miner should accomplish. His mental estimate is necessarily based on what the average man does accomplish, and while, in order to keep his men at all, he must make allowance for adverse accidental conditions, he cannot possibly know, from day to day, to what extent these have actually impeded each man's output.

Another method of securing good work is that of paying a little above the standard wage for the district. This may be effective, so long as one's neighbors do not adopt the same original idea. If they do, the remaining mines have to follow suit, or put up with the incompetent residuum. The final outcome is that we find we have succeeded in raising the general wage-level of the district, without making any change in the output of the men. The contract system, on the other hand, by holding out to every man a reward for working harder or using his brains more, and a penalty for laziness and stupidity, eventually raises the level of the labor efficiency of the entire district, although it may take several years for the improvement to become manifest. The day's pay system makes no provision for men and boys who are learning the business of mining. Under it they are compelled either to get their first jobs under false pretenses, pretending to be skilled miners when they are nothing of the kind, or to bribe some foreman. Under the contract system they can al-

ways get taken on to assist the more experienced miners, not as equal participants but as earners.

The tributing system is especially applicable to the extraction of small, irregular patches of pay ground, to the final robbing of pillars in old stopes prior to caving and abandonment, and to working of narrow rich ore streaks where care in placing holes becomes more important than the quantity of work. Contrary to general belief, tributers do not often perform much real development work, unless encouraged by a 'footage' bonus or other special payment. Tributers do not usually work hard and care should be taken to pay a 'footage' proportioned to the value of the work.

The maximum benefit of the tribute and contract systems is realized when pitches or contracts are taken by small parties of men, where every man realizes that he is dependent on his own exertions. We used to find that we could let driving contracts at a lower price per foot when we stipulated for one shift only, than when we required two or three shifts. In the former case, the men knew that if they did not make the progress they expected it was their own fault, and it was useless to blame it on the other shift. Similarly with tributing. I can see very little benefit in letting out large leases, as has been frequently done at Telluride and Cripple Creek. Where a lessee has to employ 50 or 60 miners, his lease is really an independent mine. It is not easy to see why the company's manager should not be able to employ equally good men, and use equally good judgment in following ore, as such a lessee, and the failure to do so would appear to be a reflection either on the capacity or the loyalty of the mine manager. On the other hand, when leasing to small parties of men, each of whom is vitally interested in the outcome, we are securing the brains of a whole host of men in place of one, and also their watchfulness of the ground and the ore to a degree that becomes a physical impossibility for any manager and his staff.

The greatest recent improvement in methods, tending to lower underground costs, is probably the adoption of the small hammer drill for stoping and raising. Except in the softest veins, such as the California, this has resulted in a cheapening of the expense of breaking ground in stopes. On the other hand, the dust produced is a difficulty which has still to be surmounted. For driving, the water feed to this type of machine has not been generally successful. I have seen a Waugh machine run with the air exhausting through hollow steel so as to discharge the cuttings, the resulting dust being so dense that I wonder any miner would work under conditions so dangerous to health. Except in cross-cuts or hard veins, driving can be done cheaper by single-jack than by machine. The work is, of course, slow, but this can usually be made up for by keeping a sufficient number of headings in progress. The levels can be carried narrower, and the smaller amount of explosive used shatters the walls less, so that the maintenance of hand-driven levels is less than that of levels driven by machine. As for double-hand drilling where power is available it is practically extinct. ground so hard that it cannot be economically drilled single handed requires machine drills. The difficulty of breaking hard and tight ground has been lessened by the use of blasting gelatine, first regularly employed in the Roosevelt and Argo drainage tunnels. This is of relatively small importance in the soft Gilpin County veins.

The milling methods in use in Gilpin county have been subjected to even more drastic condemnation than the mining, with on the whole, equally insufficient reason. By this I do not mean to be understood as claiming that the savings made on any given ore are the greatest economically possible. If it were practicable to design or adapt each mill to the particular type of ore it is to treat, much improvement could be realized. But here, as with the mining, the real crux of the problem is the nature of the ore-bodies. The ores even in the same vein vary so widely, physically and mineralogically, and the ore-bodies producing any given type of ore are usually so discontinuous, that by the time one has adapted his method to any particular ore it may have been exhausted, and one may have a very different ore to treat.

Hidden Treasure Mill, Gilpin County, Colorado.

The mills now in use are of three principal types: (1) The old-style, high-discharge, Gilpin County stamp-mill, in which battery amalgamation has been brought to a high degree of perfection, at the complete sacrifice of crushing efficiency. The reasons for the efficient amalgamation in the high-discharge stamp-mill have been convincingly indicated by T. A. Rickard in his 'Stamp Milling of Gold Ores,' and also by the late A. N. Rogers in a paper read twenty-five years ago before the American Institute of Mining Engineers. (2) The medium discharge, fast-drop stamp-mill, depending on outside plate amalgamation, the inferior amalgamating efficiency being compensated for by more effective concentration, due to the sulphide particles being less completely slimed. (3) The gradual reduction, straight concentration type of plant, in which standard wet concentration practice is adhered to as closely as the necessarily small size of the plant and other local conditions will permit.

Of these dissimilar types of mill, each will give commercially better results on certain classes of ore. Of neither can it be justly said that it is best suited for Gilpin County ores -or that it represents the

most 'modern' practice. I am inclined to think, as the result of my own experience, that the first-named type of mill gives the best commercial, if not the best technical, extraction, on the larger proportion of ores. I need hardly say that the mechanical features of the old high-discharge mills—the absence of crushers and mechanical feeders, etc., are excusable only because these appliances were unknown when the mills were built, and there is now insufficient fall to install them. This, however, does not affect the metallurgical features of the method. Gold recovered in the form of crude bullion by amalgamation sells to the mint for $20.67 per oz., and is subject only to nominal charges for refining. Gold recovered in sulphide concentrate, on the other hand, is paid for at the rate of only $19 per oz., and every ton of concentrate has to pay a minimum smelting rate of $3.50 and a minimum freight of 75c., so that it may frequently pay better to secure a smaller actual saving of gold, if a larger proportion be obtained in the more cheaply marketable form.

Speaking of the use of mill runs for testing, the old Gilpin County practice was to rely on mill runs throughout. One good reason for this was that the assay tells only half the story. Take for instance an ore assaying $5 per ton in gold. If $4 of this can be extracted in the form of retort bullion, it will usually be low-grade payable ore. If, on the other hand, only $1 is recoverable by amalgamation, and $3 more in the form of a fairly high-grade concentrate, it may be just on the boundary line. If, again, the ore yields $1 per ton by amalgamation, and concentration is in the ratio of three to one, yielding a product assaying $9, worth only $4.50 per ton net after deducting freight and smelting charges, then the commercial extraction, on the original ore, is only $2.50 per ton; and it is clearly unpayable.

The custom stamp-mills, with their small units of five stamps, lent themselves particularly well to this system, as a fairly complete clean-up can be made on very small quantities of ore. In Black Hawk today the millmen will accept and separately clean up lots as small as four tons; separate lots of eight tons are quite usual. In this way the mill-runs may be merely a large-scale sampling, but present the advantage of giving the commercial yield rather than the mere assay value.

The straight concentration mill does not lend itself to this system as well as the stamp-mill, because so much of the mineral is continuously tied up in jig and table beddings, and elevator sumps, and moreover, because the working unit is so much larger than the five-stamp battery, so that an accurate clean-up can hardly be made on lots of less than 30 to 50 tons.

Much of the criticism which has been popularly directed against Gilpin County milling is based on a superficial observation of the sulphide particles flowing off in the waste. That a considerable proportion of the sulphides—possibly one-third in the case of the high-discharge stamp-mills—fails to be saved by the concentrating appliances used, is true, but the fact does not necessarily justify condemnation of the milling practice or the concentrating tables used. You will often hear it said, by people who ought to know better, and would know better, if they took pains enough to investigate, that this loss of finely ground sulphides would be obviated by the use of 'modern' concentrating tables, such as Wilfleys, in place of the Gilpin County bumping-table. All this is beside the question; the bumping-table is just as valuable a machine as the Wilfley, and on fine unclassified pulp makes just as close a saving, although its range of utility is narrower.

Obviously it is possible to save a further percentage of these fine sulphide particles. The question is, how far will it pay to do so? The average assay value, in gold and silver, of the concentrate produced at one of the largest Black Hawk custom stamp-mills, for the last six years, has been a little below $9. Deducting smelting and freight charges, this is worth, net, $4.15 per ton. The concentration ratio averaged six to one, so that the net saving per ton of ore, in the form of concentrate, was 69c. If we could assume that one-third of the sulphide particles was lost, that 60% of this one-third could be saved by closer concentration, and that the selling value of a concentrate produced from the fine escaping particles would be equal to that of the concentrate actually saved, we should arrive at the conclusion that a further saving of 20.7c. per ton of original ore might be made, with a considerable capital investment and a small increase in milling costs. The gold in the sulphides is still in the metallic state, the finer division unlocks and exposes it to the action of the quicksilver, and consequently the fine particles are robbed of their contained gold to a greater extent than the coarse. So much for theory. It has been abundantly confirmed by practice. At the Hidden Treasure and Perigo mills, we used for years, bumping-screens to cut out the coarser sand over 60-mesh, and secondary bumping-tables and vanners, on the first bumping-table waste, and thereby saved a large additional bulk of concentrate. But these fine 'second concentrates' were invariably poorer in gold than the first—averaging more than 25% less in value. Still more important was the fact that the silica content could never be reduced sufficiently low to be salable on the same basis. It is generally known that fine sulphide concentrate can rarely be reduced below 20% insoluble without inordinate loss; and so we found it. The result was that a great deal of this second concentrate was commercially worthless, and the net saving only justified the extra expense when working on certain ores, such as those from which the gold in the heavy minerals was imperfectly extracted by amalgamation, or those which contained considerable silver.

I am hopeful of economic improvement in the milling practice of the district. In this connection, the cyanidation experiments recently made by Alsdorf, Draper, Gross, and Weed, afford considerable ground for encouragement. Of course, cyanidation experiments on Gilpin County ores and tailing are not new. A. L. Collins and I went into the question thoroughly, as we thought, ten or twelve years ago, and probably a host of other experimenters did the same. But finding the consumption of cyanide prohibitive,

in our attempts to extract concentrate, we confined our experiments to the treatment of tailing, and we reluctantly decided that the game was not worth the candle, especially as the saving by cyanidation appeared to be best on the ores on which fine grinding and amalgamation already gave the most satisfactory results and as we made little progress with the silver-bearing ores, and also with those from the lower Russell Gulch district, in which tellurides occur intimately intermixed with the sulphide minerals. Alsdorf and his associates have shown that by treating fresh pulp without exposure to the air pyritic mill tailing and even concentrate can be leached without undue consumption of cyanide. Mr. Gross informs me that in his latest experiments, he is able to extract 70% of the gold and 25% of the silver in concentrate by simple leaching, with a consumption of only 3 lb. of cyanide per ton of ore. Their experiments suggest that in the case of a large class of Gilpin County ores, the present commercial saving can be improved upon, not so much by increased extraction—for that is counterbalanced by the higher cost of treatment—as by getting the gold and silver into the more marketable form of cyanide precipitate and bullion, and so avoiding the heavy expense of freight and smelting on concentrate.

I am sometimes asked what is the average percentage of saving made in the Gilpin County stamp-mills. It is a difficult question to answer. The savings vary so greatly with the ores treated that no general statement can be of much value. When we speak of mill-savings in percentages, everything depends on the original value of the ore. A saving of 75% of the value of an ore assaying $4 is pretty good. The same percentage of saving on $20 ore is poor. What we have to consider is the actual assay value of the tailing, and whether it will cost more than the value recoverable to extract it.

During the cyanide experiments we made many years ago, we carefully sampled the entire flow of mill-tailing in the creek over a considerable period. Below the Hidden Treasure mill, the average tailing assayed, gold 0.045 oz., silver 0.80 oz. per ton. Above the Rocky Mountain concentrator the average tailing in the creek assayed, gold 0.065 oz., silver 1.00 oz. per ton. Figuring back with the aid of the records of bullion and concentrate saved at the former mill during the same period, it appears that the average saving, in bullion and concentrate, of everything that went into the mill, was about 75% of the gold and less than 40% of the silver. But the average grade of the ore was low, and we have repeatedly observed that, with better ore, the increase in assay of the tailing is by no means proportionate. I think I may safely estimate, on ore of average grade (say $5 to $10 in gold) a saving of 80% of the gold and 40% of the small silver value present, as characteristic of stamp-mill practice on the more amalgamable ores.

But there is a great deal of ore in the district, of an assay value of $5 to $10 in gold and silver, which is absolutely unpayable by any method or combination of methods now in use. I mean that it is large in the aggregate; I do not mean that the tonnage of such ore blocked out in any one mine is great. Part of this is sulphide ore, as in the lower Russell Gulch region, the gold value which is largely in the form of minute specks of telluride minerals. A considerable portion, notably that of the Kokomo Seattle-Addendum vein and many other veins producing similar ore around the fringes of the central district, is a complex sulphide ore containing almost as much silver as gold. The latter ores will often permit of a fair extraction of the gold by simple concentration. But the concentration ratio is low, and the silver saving invariably unsatisfactory. Above all, we are faced by the difficulty previously spoken of, the great variability and the relatively small size of the individual ore deposits. Careful hand sorting appears to be the only effective method of realizing profit from such ores, and unfortunately the high cost of labor is a great hindrance to sorting. The use of boys, of from 12 to 20 years of age, at wages suitable for such work, seems to me the most promising solution. Every old mining camp is at present full of young fellows who are through with school, unable to do the work and earn the wage of men, and are a nuisance to the community. To employ them as ore sorters would be valuable training for them in distinguishing ores, and would prepare them for better paid labor later on.

The so-called white oak timber of our markets is often a mixture not only of various species of the white oak group, but also of other species, such as the red oak. This generally unknown fact is reported by the U. S. Department of Agriculture, which, as a part of its forestry work, is frequently called upon to pass judgment upon the identity of market woods in dispute. At the present time it is almost impossible to obtain a consignment of white oak that does not contain pieces of some other species. Of the white-oak group those most used, in addition to the true white oak, are bur oak, chestnut oak, chinquapin oak, post oak, swamp white oak, cow oak, and overcup oak; of the black-oak group, Texas red oak, red oak, and spotted or water oak. Real white oak timber of No. 1 quality is very largely cut into quarter-sawed boards, while a combination of one or more white oaks and red oak may constitute other cuts of 'white oak.' In many markets, the term 'cabinet white oak' is now understood to include a mixture of white oak and red oak, while it often signifies red oak only.

The report of David F. Wilber, American Consul at Kobe, Japan, states that shipments of sulphur from that Japanese port increased largely during 1909. This sulphur is the product of volcanic springs on the island of Kyushu, and when simply congealed, in which condition it is sacked and shipped, the result is 99.8% pure sulphur. Exports to the United States can hardly be expected to increase very much, as this product has been held subject to the duty on refined sulphur. On the other hand, sulphur mined in the Hokkaido in a solid state and subjected to a process of melting in large boilers and then sorted into several grades is admitted to the United States free of duty.

The Eastern Canadian Mineral Belt

By Theo. F. Van Wagenen

The success that has attended the development of the silver-bearing lodes of Cobalt, coupled with the prosperity of the copper-nickel mining industry that has been established for many years at Sudbury, makes it clear that eastern Canada has a mineral belt of great importance, and will justify some general remarks about the region between the Great Lakes and Hudson's Bay; a part of the continent which, until a few years ago, was considered as of small account except for its forests and fur-bearing animals. Geographically there are few parts of North America less intimately known to the general public. This is not the place for an extended account of the rise of the Dominion as a nation, but it will not be amiss as a preface to some statements as to the Hudson's Bay country, to give an outline of the history and topography of British North America, which has now become completely organized politically, and whose progress commercially is really of more importance to Americans than that of any other part of the world outside of our own land.

Eastern Canada.

It is altogether likely that the fine old Norwegian viking, Bjarni Herjulfson, who was cruising off the southwest coast of Greenland in the year 986, and who reported having sighted land toward the west, was the first white man to see the shores of Canada as represented by the forbidding and rugged coast of Labrador on this side of Davis Strait. Four years later his countryman, Leif Ericson, sailed for a thousand miles or more down that inhospitable shore, trying to find a harbor and some signs of human habitation. Both these bold explorers left such hazy and indefinite accounts of their discoveries that it has been impossible to identify the exact position of the lands they saw. Nor did their stories apparently make much impression at home, for nearly five hundred years passed before the next European, the Englishman John Cabot, appeared in the same region. He, however, had the good fortune to slip in between the bold headlands of Newfoundland and Cape Breton, and discovered the great bay of the St. Lawrence; and claiming it all for his country, together with everything in the shape of land and water around or near it, as was the cheerful custom of the explorers of the day, laid the foundation for the British claim for the possession of that part of the new world. In 1504 French fishermen began to frequent the Newfoundland banks, and during the years 1506-8 the estuary of the St. Lawrence was thoroughly explored by them, and its coasts well mapped; thus laying a still broader foundation for the claims of France to the same region. In 1535-6 Jacques Cartier ascended the great new river as far as the present site of Montreal, and during the succeeding years of the century the southern part of the country now known as the province of Quebec was dotted with settlements of his countrymen. In 1603 occurred the first voyage of that old sea-dog Champlain, who pushed his explorations westward to the shores of Lakes Ontario and Huron, and southward into what is now the State of New York, giving his name to the long and lovely lake lying between it and Vermont. It was during this period of daring discovery that the French came into intimate relations with the natives of the St. Lawrence valley, and espousing the cause of the northern tribes (comprehended mainly under the names of the Hurons and Algonquins) against a more southerly combination known as the 'Five Nations,' headed by the Iroquois, who later were backed up by the English, brought on the Indian wars that, with occasional intermission, continued until the close of the century.

In 1610 Hudson's Bay was discovered by the Englishman who gave it name, and shortly thereafter began the long war between the British and the French for the possession of the St. Lawrence valley and the upper Mississippi country, which continued, with occasional intermissions depending mainly upon the political conditions and changes in Europe, for fully 150 years. During the period perhaps the greatest sufferers were the natives, over whose lands the fierce contest raged, and who were involved, sometimes much against their will, but generally without difficulty through mutual jealousies skillfully played upon by the invading white man. During the long conflict some of the tribes were practically annihilated, and all were so broken and depleted at its end as to be no longer formidable. In 1625 the French Jesuits began to arrive. These fine pioneers spread rapidly throughout the Lake region and became also the first explorers of the vast and wonderful wilderness between them and the Pacific ocean, where their names appear often in the appellation of rivers, lakes, and settlements.

In 1670, the Hudson's Bay company was formed, ostensibly for purely commercial purposes, but actually to give England a sea base to the north of the St. Lawrence valley from which the attack against France could be pressed, as well as from the south. The bitter struggles of the years from 1682 to 1713 ensued, at the end of which France abandoned all claims to what was then called the 'Hudson's Bay' region, and the great English company was given a chance to expand. This it did so effectually that by

1750 its posts had reached the shores of the Arctic at the mouth of the Mackenzie river and of the Pacific at the entrances to the Columbia and Fraser, including all the vast territory between, and confining the French to the lower St. Lawrence valley. In 1763 pressed as she was on all sides France gave up the unequal struggle and recognized her Canadian severe guty to England yet securing for her children in the new world full recognition of their individual rights by treaty provisions that have been so scrupulously observed by England that today there are no more loyal subjects of the British crown than the French Canadians. In 1783 England in her turn, resigned to the United States which meantime had won its independence that portion of the territory originally claimed by the French which now composes the States of Ohio, Indiana, Illinois, Michigan, and Wisconsin. In 1846, the forty-ninth parallel of latitude was agreed upon as the southern border of western Canada, thus adding Minnesota, the Dakotas, Montana, Idaho, Washington, and Oregon to the domain of the Republic. During many following years Canada was almost forgotten by the outside world. The only thickly settled portions were the southern parts of what are now the provinces of Ontario and Quebec, all the balance being practically abandoned to the Hudson's Bay company. By 1850, however, the upper Mississippi States were filling so rapidly with settlers, and the discovery of gold on the Pacific coast was drawing such a horde of miners and farmers and explorers into the Northwest, that it became evident that much of the border land to the north of the forty-ninth parallel was of value, and steps were taken toward the political organization of the then almost unknown Canadian Northwest. In 1859, the monopoly of the Hudson's Bay company was confined to the unsettled regions immediately around the Bay and the valley of the Mackenzie river, and in 1867 the Dominion of Canada was organized politically, in which were united under one government all the British colonies and possessions remaining in North America except Newfoundland. Two years later the great fur company accepted the new sovereignty. This final step paved the way for the remarkable growth and progress which our neighbor to the north has been enjoying during the last ten or twelve years, and which, from now on, may be expected to be continuous.

Topographically, a bird's-eye view of the vast stretch of continent to the north of us displays the following main features. First, the continuation northward along the west coast, with a width of three to five hundred miles, and without a break from the Washington boundary to that of Alaska, of the rugged series of parallel mountain ranges that are known as the Rocky Mountains. From this vast uplift, composed mainly of sedimentary rocks, the country slopes away eastward in broad plains toward Hudson's Bay, for many hundred miles. The western parts of these plains are treeless and semi-arid, like our own, though crossed at frequent intervals by rivers of size and importance. Second, traversing these plains in a general east and west direction, are two almost imperceptible divides, one of which throws the waters of the Mackenzie, the Coppermine and the Great Fish rivers northward to the Arctic while the other drives the drainage of the Missouri and Mississippi southward to the Gulf of Mexico. Two forks of the latter curving respectively to the north and the south of Lake Superior and then extending eastward again confines the waters that reach the ocean through the Great Lakes and the St. Lawrence.

The Canadian plains are underlain with sedimentaries like our own, but they fall away rather more rapidly than with us, and when within four to five hundred miles of Hudson's Bay they begin to rise, forming a basin with its longer axis bearing north and south. Finally, the beds terminate on an ascending floor of Archean granites, gneisses, and schists which after gaining altitudes of 1000 to 1500 ft., continues as a plateau for fifty or one hundred miles more and then sinks away rapidly to sea-level all around the great Bay. This extensive exposure of primitive rock, which is the third great topographical feature of the Dominion, is called the Laurentian Plateau. It completely surrounds the southern end of Hudson's Bay, and extends up each side toward the north like the arms of a gigantic letter U, passing under the sedimentaries, as stated, to the westward, but on the eastern side extending clear across what used to be known as Labrador, but which is now called the province of Ungava, to the shores of the Atlantic, where it constitutes a bold and rugged coast line that in places rises to heights of over 6000 ft. To the southward this remarkable area of ancient rocks extends into northern Minnesota, Wisconsin, and Michigan, completely encircling Lake Superior, and then passes under later formations. It is this old geological continent, which covers practically all of the provinces of Keewatin, Quebec, Ungava, and Labrador, and nearly all of Ontario except the peninsula between Lakes Huron, Erie, and Ontario, which is beginning to be recognized as a mineral field of unique characteristics and possibilities. What is known of it to date is expressed in the wonderful iron deposits in northern Minnesota, Wisconsin, and Michigan, which occupy points along its southern edge, the copper districts of the Keweenaw peninsula, the copper-nickel field at Sudbury, and the silver-cobalt-nickel lodes of the Cobalt district. From any point of view it is one of the most remarkable regions, mineralogically, at present known. It is but a short time, geologically speaking, since the great ice sheet of the last glacial epoch disappeared from its surface, leaving it dotted with millions of big and little lakes connected by streams that are in places navigable by canoe, but which are broken at many points by rapids so that frequent portages are necessary. If it was ever covered wholly or in part by rocks of later date, they have been completely scored away. What is left is a tremendous area of the original crust of the earth, thinly covered here and there with the remains of the very first of the beds that were laid down on the floor of earth's oldest ocean. What may not be expected in the way of mineralogical and geological surprises from such a region! Though the soil is shallow, a dense forest

of spruce, pine, hemlock, tamarack, and birch covers much of the land. There are no well defined mountains, but in their place an unending succession of low ridges, running to all points of the compass and enclosing depressions that are invariably filled with water. The maximum depths and heights are from two to three hundred feet. In making the frequent portages that are necessary the traveler is impressed with the abundant occurrence of dikes of ancient eruptives. The surface is fairly damascened with them. All the rocks are of a dark and sombre color, and in chemical composition are probably basic. Everywhere the effects of strain and distortion such as would be expected to occur throughout a semi-plastic mass, are visible, being particularly apparent in the banded rocks. Little surface decomposition has taken place, and experience in mining is to the effect that the lodes are tight and carry little water. The ore deposits to be expected therefore will belong mainly to the primary class, consisting of the metals of high specific gravity, rarely oxidized, often intimately associated, and usually in the form of sulphides or in the native condition. It is a region where the prospector and miner will find himself somewhat nearer to the unknown and mysterious interior of the globe than is usual, and will be confronted with many of the rarer minerals. Gold is widely distributed, but at only a few places has it yet been found sufficiently concentrated to be profitable. It is certain also that several of the metals of the platinum group have been detected, and for these the formations are particularly friendly. Important deposits of the radio-active elements may also be anticipated.

The most accessible new portion of this interesting region is along the line of the Temiskaming & Northern Ontario railway, a government built and operated concern that begins at the town of North Bay on Lake Nipissing and is heading for Hudson's Bay. It passes through the town of Cobalt, which has many of the well known characteristics of an American mining camp. The road is about 270 miles in length, and terminates (for the present) at a little town called Cochrane. Here the surveyed line of the Grand Trunk Pacific railroad (also a government institution) is intersected, and grading and track-laying upon it are in progress in both directions. This new trans-continental line begins nominally at Quebec, and will run in a direction a little north of west, directly across the Laurentian Plateau, passing a few miles to the north of Lake Abitibi, and thence, approximately along the fiftieth parallel, to Winnipeg. It will be a couple of years at least before it will be open for traffic. Meantime Cochrane is being made an attractive supply and outfitting town, from which, as a centre, it is hoped that the prospector may be induced to explore the surrounding country, for the officials of the Dominion government are well aware of the promising nature of the region. What success will be attained by this rather paternal way of drawing population and opening the country remains yet to be seen, and depends much upon the miner's opinion of the Canadian mining law. It is the popular impression that the country is covered with prospectors at the present time, for reports of new finds are continually coming in. In the course of a week's travel in one of the most attractive parts I failed to meet a single one, but did meet several 'claim peggers.' There is a broad distinction between the two.

It is not a difficult country to prospect, nor yet an easy one. From June 1 until September I the climate is often disagreeably warm during the day, though the nights are invariably cold. The ground is clear of snow, the lakes and rivers of ice, and canoe travel delightful. One keeps moving from lake to lake across portages ranging from a quarter of a mile to a mile in length, and two hardy men with a light boat and kit can cover a big area during a season. The mosquitoes and black flies are bad for a few weeks of this period, but head veils and rubber gloves, and a bottle of oil of citronella will keep them at bay during the day, while at night it is easy to sling a net over the bed. Rains are frequent and uncomfortable during July, and between the showers the air is muggy and oppressive, and so much of the country is covered by lakes and swamps that travel on horseback is out of the question. On the other hand, there are no mountains to speak of, and the bedrock comes to the surface all around the lakes and on the summits of all the ridges as well as over much of their slopes. Thus the veins are easy to find and trace. Fish and game are abundant, and in the towns along the railroad or near them, all necessary supplies may be purchased at reasonable prices. The few natives that are left are segregated on reservations, and are entirely friendly. The only large animal that might be dangerous is the black bear, and he will always make off if given a fair chance. The woods are full of blueberries and raspberries. The spring and fall months are uncomfortable, for summer is coming and going, and weather occurs that fools the unwary, and makes much trouble. During the winter the snow accumulates to depths of six to twelve feet, the mercury sinks to forty and even sixty below zero, and prospecting is impossible. The residents, however, consider the winter the finest of the seasons, for traveling on the snow and ice is easy and expeditious, the winds are light, and the game is at its best.

The coal beds of South Park, Colorado, occur in what is presumably the Laramie formation, consisting of sandstone with subordinate beds of carbonaceous shale and ranging in thickness from knife-blade seams to 375 ft. No fossils have been found in the formation but it rests on a yellow sandstone containing upper Montana marine fossils and is unconformably overlain by conglomerate beds that are undoubtedly equivalent to part, at least, of the Shoshone group, as typically developed in the Denver basin.

There are no fixed rules of design as relating to gas-engine bearings, construction usually following the results of experience. In the leading makes the diameters of the main and crank-pin bearings approximate 35% of the bore of the cylinder; the piston-pin bearing approximates 25 per cent.

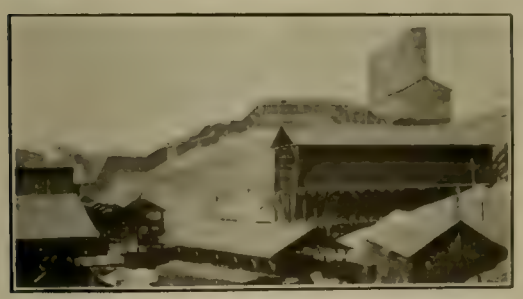
Smelter Fume in Shasta County, California

By Sydney S. Smith

With the closing of the plant of the First National Copper Co. at Coram by the farmers' association of the district and the suspension of the Bully Hill at Winthrop, on account of a Government suit, the smelter fume question in Shasta county, California has recently reached an acute stage, and with copper between 12 and 13 cents per pound and curtailment facing the large producers, there is little in

Balaklala Smelter at Coram.

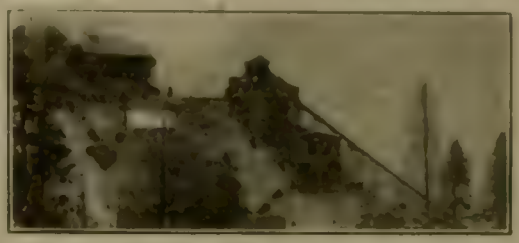
ducement for the smelting companies to expend large sums in additional equipment. Last spring the farmers formed the Shasta County Farmers' Protective Association and a compromise was effected with the Mammoth and First National companies whereby the solid particles should be removed from the smoke and the SO_2 diluted before the fume passed into the air. To attempt to relieve the situation by the erection of acid plants is at present out of the question as the estimated production of H_2SO_4 by the smelters of the county is 1200 tons 60 B. per day; the market, aside from that supplied, being about 40



Bag-House at Mammoth Plant, Kennett.

tons. The compromise was based on the decision of Judge J. A. Marshall, in the Utah Federal Court, who held that the SO_3 uniting with the moisture in the air to form H_2SO_4 was the main cause of damage, the SO_2 having but slight effect. There are at present three copper smelters in Shasta, the Keswick plant of the Mountain Copper Co. having been practically dismantled. The ones remaining are the Mammoth plant of the United States Smelting, Refining & Mining Co. at Kennett which includes five blast-furnaces having a capacity of over 2000 tons of charge per day, the ore in which contains 40% sulphur; the Balaklala, or First National Copper Co.'s plant at Coram, which contains four McDougall and three blast furnaces with an operating capacity of 1400 tons of charge, and the Bully Hill plant of the General Electric company which handles approximately 600 tons of charge per day. The ore from the Balaklala mine contains approximately 41% sulphur and the Bully Hill 20% sulphur with considerable zinc.

The Mammoth company through its parent the



Balaklala Tram, Mine Terminal.

United States Smelting, Mining & Refining Co. having gone through a similar experience in Utah, had plans ready for a bag-house, since built, which contains 1000 long woolen bags to filter the smoke. Experiments were tried with both cotton and woolen cloth, the wool, though higher in first cost, proving

Balaklala Smelter, General View.

to be the more effective and lasting longer. The gases from the furnace pass through a large chamber where they are mixed with cool air, and through intercooling tubes to the bag-house proper which is divided into five compartments any one of which can be shut down for the removal of the dust. The

Balaklala Tram, Smelter Terminal.

bags are attached to a mechanical shaker, the jar from which loosens the dust so it falls into hoppers, from which it is drawn into cars. It is then dumped into a mixing puddle, sprayed with water, and briquetted, the bricks then being returned to the blast-furnace.

The First National company was not so fortunate in the matter of ready plans and had to spend considerable time in experimenting before finally adopt-

ing the Cottrell process as being the least expensive both as to first cost and upkeep. The former dust-chamber was tapped and nine Cottrell units set in parallel to convey the smoke to the new dust-chamber, from which the fume, free from dust and SO_3, is drawn by fans that mix it with cool air, thus lowering the percentage of SO_2 in the gas that escapes from the stack. The Cottrell units consist of steel chambers 10 by 10 feet square with hopper bottoms from which the dust is removed by a screw conveyor. Inside the chambers are a series of positively charged bars made of two strands of asbestos and two copper wires set between a series of iron plates which are grounded. In passing through the apparatus the smoke is forced against the high-potential, asbestos-covered, bars, the solid particles receiving a positive charge which precipitates them on the low-potential iron bars. The complete plant is under control of the operator in the power-house and any of the units may be shut down at any time for cleaning. This process consists of jarring the plates slightly to shake the dust into the hoppers. A lateral conveyor serves all the units taking the dust to a briquetting machine from which it will be returned to the blast-furnace.

Owing to the time spent in experimenting and constructing the new machinery, the First National company could not complete the plant on the stipulated date, July 1, so asked the privilege of running one furnace at half capacity for the purpose of holding the force together, and having the smoke to experiment with while constructing. It was also desired to treat a small amount of Bully Hill ore as the company had a contract for such work. However, the farmers, like men intoxicated with a new-found power, voted 60 against 2 in favor of closing the plant. This, with the shut-down at Bully Hill on account of the Government, the reduced capacity at the Mammoth, and the closing of a number of independent low-grade quartz mines that can only be operated when their product is sold to the smelters for flux, threw out of employment between 1200 and 1500 men and greatly endangered the industry from which the county derives its principal revenue. The assessed valuation of these smelters, exclusive of the mines, at 60% of their real value is $1,757,463. They employ over 2400 men and distribute a payroll of approximately $200,000 per month.

Important smelting operations began in Shasta county about 1897, and since that time the assessed valuation of the county has sprung from about $7,000,000 to over $16,000,000, three-fourths of this increase being directly due to increased activity in the copper belt. With the revenue derived from the taxes paid by the companies mining and smelting copper ore, Shasta county has enjoyed an era of marked prosperity. New communities have sprung up and the older towns have become prosperous business centres. The county is free from debt and without increasing the tax rate or issuing bonds has purchased toll roads and built new highways, constructed steel and concrete bridges, erected a county hospital, a hall of records, and a high school, employing at the latter a staff of instructors that would otherwise be absolutely impossible. In the area in question the merchants derive considerably over 90% of their support from those connected with the mining and smelting industries. Outside the tract near Keswick less than 5000 acres are affected seriously while 10,000 acres show slight though tangible evidence of damage. Within the Shasta National Forest, which the Government claimed was injured by the Bully Hill plant, two sections showed slight damage and one of these was railroad land. The timber is the poorest grade of 'bull' pine and scrub oak, being useful only for mine timbers and firewood. That close enough to the smelter to suffer from the fumes was practically all cut before the smoke had a chance to seriously affect it. Within less than three miles of this plant both vegetables and fruit trees flourish although for a long time the most destructive practice, that of roasting in open heaps, was maintained. Three years ago when the General Electric Co. took over the property it built a standard-gauge railroad from Pitt, on the Southern Pacific, to the smelter at Winthrop, and completely remodeled the plant, erecting a high stack in order to allow the gases ample opportunity for diffusion.

The effect of the smoke near the plants is cumulative, especially on evergreens, such as the pines, but is largely overcome by cultivation and irrigation. The farms in the Anderson district, while opposing the smelters the strongest, produced record crops last year when a greater volume of smoke was thrown into the air than at any other period in the history of smelting in the county. A certain damage is wrought on both grain and garden truck, but the local market for these furnished by those engaged in the copper has far more than compensated for the losses. It is, however, easier to lay the blame for failure of crops on the smoke than to investigate the deterioration of the soil or various blights, and the companies' pocket-books have been quite accessible as every effort to avoid law-suits has been made. While the spirit of those who have been the leaders in the movement against the smelting companies has been one of fairness and compromise, the majority with short-sighted policy have believed in obtaining 'all the traffic would bear' demanding their 'pound of flesh' even at the risk of killing the business that has supplied over 90% of the trade to the merchants of the district and brought the county from comparative obscurity to one of the leaders of the State.

After exploring the eastern coast of Kamchatka for two years, the Prozorov expedition has returned to St. Petersburg. Mr. Prozorov, who is the president of the St. Petersburg Stock Exchange, obtained a concession in Kamchatka extending from Baron Korff bay to the Kamchatka river, amounting to some nine million acres, and sent out an expedition under an engineer named Natsvalov to explore it. In the vicinity of Baron Korff bay some beds of good coal were found, but the net result of the expedition was to show that there are no mineral resources of importance in eastern Kamchatka. Only traces of placer gold, of copper, and of sulphur were found by the expedition.

Filter-Pressing Slimes

By M. W. von Bernewitz

*The filter-press which has done so much for the successful treatment of the sulpho-telluride ores of Kalgoorlie, Australia, has a rival in the vacuum process, and this paper is written with a view to arousing more interest in the cheaper working of the press, it being doubtful whether its efficiency in extraction can be improved.

At the Associated Northern Blocks, where these notes were compiled, the average value of the ore of late has been $6.48 per ton. It is dry crushed in three No. 5 Krupp mills. The crushed ore is roasted in six Merton ordinary type furnaces. This is ground in eight 5-ft. grinding pans with weak KCN solution. The slime from the pans is thickened, run into vats, and agitated in the usual way. The three presses are of the Dehne type, with 50 frames 39 by 39 by 3 in., and 50 plates for the filter-cloth, and the angle-lever screwing-up gear. Each press holds 4.75 tons of dry slime. Filling is done by a Pearn 3-throw pump running at 20 r.p.m., with plungers 12 by 10 in., taking about 15 minutes to fill a press at 60 lb. pressure, that is, if the slime is fairly thick. In filling there appears to be a settlement of the heavier slime particles toward the bottom of the cake.

In the centre of nearly every cake of slime is a thin seam of fine sand, due to the solution, during filling, going out on either side. It is a curious thing, and possibly has some influence on subsequent washing. Nothing is gained by filling presses at high pressure. Sixty pounds has been found right for speed in filling and economy in power. A pump similar to that used for filling, but running at 13 r.p.m., is used for washing the presses. Experiment has demonstrated that 75 lb. is the right pressure for good and cheap washing. At 120 lb., 5.2 tons of wash is pumped through in a half hour, and at 75 lb., 4 tons, this giving less than one ton of wash per ton of slime. This varies with the way the press has been charged. In washing, the solution enters the high pressure plate, passes through the cloth, then through the 3-in. cake, and finally into the low-pressure plate and out.

The drop in value is fast from the start to after 10 minutes, then decreases slowly. The sump solution assayed a trace of gold and tested 0.06% KCN. During filling the vat charge was only 0.036%. With the low-grade ore treated most of the gold was dissolved in the pans and an agitation of only four hours was necessary with 0.036% KCN. This was run from the presses to the zinc-boxes, but was made up with strong solution before passing them, thus giving 0.06% sump solution, when the agitator charge was only 0.036.

Mention was made of the settlement of slime particles during filling. Careful sampling gave an average residue of 30c. per ton from the top, centre, and bottom of the cake, the sand parting being the same; at the same time, it would seem that the coarser material would let more wash through to the detriment of the finer portion of the cake. This is true on very sandy slime. A water wash of 5 min. after 25 min. KCN wash is of little benefit, and tests show that it takes 20 min. for the water to thoroughly displace the cyanide. Blowing or agitating a press charge after filling and washing is of no benefit.

As to the amount of soluble gold left in the residue, samples washed for some time with water showed 20c. per ton less than that discharged. It will not pay to go on washing until the soluble gold is all out, and it is doubtful whether it could be washed out. With high grade ore, or when the roast is poor, the difference is much greater. With a residue assaying $1.92 per ton the washed samples would be 72c., and on a 96c. residue, about 48c. per ton. This shows the faulty washing (or something else), that goes on at times in the press. Washing presses from the high or low-pressure plates gave no difference, only keeping the cloths a trifle softer. Changing all the cloths regularly has been done with fair results in better washing, but did not pay. One trouble was that the cakes would not dry properly for some days, this being bad for discharging to belts. Cloths here last from 6 to 8 weeks. Hessian was tried under the cloths for some time to save them from cutting, but the advantage was not equal to the expense. Corrugations on the plates, especially the high pressure, get full of lime compounds, which interfere with the free flow of the wash. It is fairly soft and is scraped out, but on the low-pressure plates the deposit crystallizes very hard. Assays of this have given as high as $24 per ton.

In six years at this plant only one frame was broken, but an average of two plates are broken monthly, the number of high and low-pressure plates being equal. The breakages may be due to shock from the filling pump, such as a sudden rush of pulp; or one channel in a frame may be choked and all the pressure be on one side; or from turning on the wash too suddenly, or at too high a pressure. A blocked channel is the most usual cause. Plates cost from $16.80 to $24. The Oroya-Links makes its own plates, which are good and cost $14.40 each. Martin's foundry, in South Australia, made a plate, the inside part being separate from the outside or frame part, so that there could be no breakage in the usual place. If one plunger of the filling pump is not working, the pressure rises and falls a good deal, and several breakages were due to this cause. To catch the leakage from a press 20-gauge galvanized corrugated iron is used, these lasting for two years or more. After washing, the press is dried, for two minutes, with air at 90 lb. pressure, each using 2640 cu. ft. of free air. The residue contains 22% moisture, and although this is high, it is cheaper to lose a little weak and barren solution than to use expensive air.

Two men dump 11 presses in 8 hours, being paid 64c. per press, having to keep them properly clothed, greased, and cleaned. The cycle of operations takes up the following time: filling, 15; washing, 30; drying, 2; dumping, 30; total, 77 minutes. During 1909, 44,163 tons was treated for an average extraction of

*Abstract from Proc. Aust. Inst. Min. Eng.

93%, and costing for agitating and cyaniding 31c., and for filter-pressing 25c. per ton. The present cost of disposal of residue is 10c. per ton.

Over 60,000 tons of residue was re-treated. The system consisted in trucking to the belt-conveyor, elevating to a mixer, mixing with sump solution, and running into an agitator, although no agitation was necessary, this acting really as a storage vat; filling the press and washing 10 minutes. On the last 12 months' re-treatment of 24,675 tons the average was 78% extraction at a cost of 78c., of which re-mixing cost 44c.; pressing, 24c.; and disposition of residue, 10 cents.

Some of this was hard to get at, hence the re-mixing cost (trucking, elevating, and mixing) is high. The cyanide consumption never exceeded 3 lb. per ton of residue. The vacuum plant may be cheaper in first cost than the press plant; but its efficiency is no higher, although costs are a little lower on old dumps. Some method of emptying the filter-press without having to open it is much desired, as it would do away with some of the cost of discharging, and part of the cost of disposing of the residue, and the press would only have to be opened for the renewal of cloths. Sluicing is the only method possible, and unless cheap water can be procured, this would not pay. Experimenting on this line, one end of the charging channel was left open, and the wash valve either to the high or low-pressure plates, or both, was also left open. Pumping water for half an hour at from 75 to 120 lb. pressure, from 4 to 6 tons was used and the best test showed only one-third of the slime washed out. A great deal depends on the state of the cloths; as it seems that, as soon as the water makes a channel in many cakes it simply runs away and does no further washing. These methods are too slow and expensive in power and water.

Mr. James, recently of the Golden Links, has a small press of local design fitted with a device of local invention for sluicing and had success in sluicing out cakes of oxidized-ore slime. The frames are cast with a slot near one corner of the bottom fitted with a narrow door with rubber joint, worked by a lever and cam. A 4-in. pipe runs the length of the press with a bend and nozzle for each frame. When the press has been washed the doors are opened and the pipe lifted up by an easy method, the nozzles pointing up into each frame. Water at 50-lb. pressure is used and the pipe slowly turned through an arc of 90°, the slime coming out through the doors into a launder. About 2 of water to 1 of slime would be sufficient to wash out the porous slime in the presses of Kalgoorlie. To install this system would mean fitting or casting new frames with discharge slots. The other thing necessary is water at 36c. per 1000 gal.† Some more work on these lines would be a great value to the cheaper working of the filter-press, and it is to be hoped that somebody will follow up this subject.

†This may need some explanation for American mining men. Under the new arrangement with the W. A. Government, the mines on the Golden Mile get water for ordinary purposes at $1.68 per 1000 gal., and for sluicing away residue, at 36c. per 1000 gal., but there is doubt whether we would be allowed to use this cheap water in the presses.

GOLDFIELD CONSOLIDATED REPORT

The following data are from the August report of the Goldfield Consolidated Mines Company.

TONNAGE PRODUCED

	Wet Tons.	Dry Tons.	Av. oz. per ton.
Combination	4,875	4,641	1.50
Mohawk	8,313	7,913	1.29
Red Top	4,022	3,929	2.06
Clermont	8,077	7,687	2.31
Total	25,287	24,170	1.78

The performance of the mill was as follows:

Dry tons milled	24,170
Average value per ton	$36.82
Total value	$889,968
Loss in tailing	$58,455
Value realized	$831,515
Percentage extracted	93.43

EXPENSES

	Amount.	Average per Ton.
General:		
Bullion tax and marketing bullion	$ 16,000	
Administration, etc	16,000	
	$ 32,000	$1.32
Mining	80,000	3.31
Transportation	3,300	0.14
Milling:		
Milling and cyaniding	$58,200	
Marketing concentrate residues	9,600	67,800	2.81
Construction	25,000	1.03
Net cost	$208,100	8.61
Loss in tailing	58,453	2.42
Total costs and losses	$266,653	11.03
Profit per ton		$25.79
Total value of ore		$36.82
Total profit for month		$623,415
Percentage of profit		70.05

For the first time since March the mine produced approximately full tonnage. This might have been reached in July except for some shortage of water There is no reason to expect any shortage in future. The mine looks well. The total advance in exploration work was 3297 feet.

The showing of the Combination was particularly good, resulting in the opening of the Hampton orebody at the bottom level of that mine. At the Mohawk mine the developments continue with fair success between the Mohawk proper and the Red Top. One stope particularly, on the 350-ft. level, near the Mohawk shaft, has been very promising. At the Laguna shaft a small orebody of rather low grade has been opened. The level now being opened in this mine is 230 ft. vertically below the bottom level of the Red Top, so that any ore opened will indicate a considerable tonnage. At the Clermont no ore of consequence was discovered during the month. Some promising showings have been met recently, but it is too early to report on them definitely. Construction is progressing satisfactorily at both mine and mill. The entire plant is in good condition. The completion of work now on hand will, in the course of two months, substitute some economies for the expense of construction.

Discussion

[illegible]

Palmarejo & Mexican Mining Company.

The Editor:

Sir—In your paper of July 23 under the head of Special Correspondence are remarks pertaining to the Palmarejo property to which I take exception. Your correspondent said "several men of position made attempts to improve the methods of mining and metallurgy. It was found that the orebodies were irregular and the content low, averaging 2 dwt gold and 15 oz. silver. The ore was of too low grade for amalgamation and would not give good results by any cyanide process known at that time."

I took the management of this property March, 1901. At that time the system of milling was dry-crushing, roasting, and pan-amalgamation. Learning that this system was very unsuccessful we at once started with a series of experiments and finally decided on a system of wet-crushing, concentrating, and cyaniding. This system was described in the Trans. Amer. Inst. Min. Eng., in a paper read at the Washington meeting, May, 1905, and also published in your paper. To save space I do not care to go into details as to the results of our operations. I would like, however, to refer you to some statements which were made at the seventh ordinary general meeting of the shareholders three years later, and to the action of the shareholders at an extraordinary general meeting convened on May 30, 1905. Much comment was made at this meeting; I would ask, in justice to my work and reputation, that you print Baron Boxall's statement, who was at that time one of the large shareholders of the company, also that of Mr. Perry, who is at present the president of the company. These statements, I think, will convince any person that the changes made by me at that time were successful, and whatever modern and up to date method that may be recommended now by E. T. McCarthy, cannot reflect on our work of five and ten years ago.

Baron Boxall: "In seconding the resolution which has been put so clearly from the chair, I should like to emphasize one subject which has been alluded to. Thomas Henry Oxnam accepted this company's retainer at a time when it was in distress, if not in commercial disgrace. He designed the remodelment of the company's operations, and in so doing made certain estimates, estimates of returns which the facts and figures disclosed to you have proved to have been understated (hear, hear) and he drew scientific conclusions as the result of his practical experience which have proved to be absolutely correct. (Applause.) It is now three years since he accepted your retainer. During that time I do not suppose there have been many hours during which your interests have been out of his thoughts. His work as the chairman has just stated, and that of the staff, has raised this company from a state of impecuniosity to one of opulence, and more than that is demonstrating that with an establishment of not more than fifty stamps we can operate under the present conditions at a profit on the basis of between £40,000 and £ 60,000 per annum, he endowed your mining interests with a capital value which it is not for me to assess. When I first spoke to Mr. Oxnam on the subject of this business, noticing that he seemed a little hesitating about the magnitude of the work before him, I took upon myself to tell him that in my judgment he was not working for a class of persons that would, after the event, either allow honorable and sound service to be corrupted in any manner or to pass into oblivion, and as an Englishman speaking to you as Englishmen, I do not suppose for a moment that any of you would fall into such a serious error. Remarks concerning him are bound up in the resolution which is before the meeting today, approving of the report shortly after the declaration of the first dividend, but I should like a message to go forth from this meeting this afternoon that we particularly wish him to come here in the spring, when we can, in his presence, pursue the subject further (hear, hear) and at the same time deal with another matter which has been under the consideration of various shareholders during the past few weeks, upon which they are provisionally resolved, and which I know have only to be mentioned to you to receive your hearty support and endorsement. I beg to second the resolution confirming the report and balance-sheet." (Applause.)

Mr. John Perry said that he was very glad to be able to endorse all that Baron Boxall had said in reference to the general manager. He (the speaker) had been engaged in mining practically all his life, and, so far as he knew, he never came across a better man. (Hear, hear.) If the shareholders compared the report with that of last year, they would see what has been done, and no doubt, they would fully appreciate the value of the general manager's services. (Hear, hear.) The motion was then put and carried unanimously. Mr. Goddard proposed a vote of thanks to T. H. Oxnam, the general manager, to the milling and mining superintendents, to the accountants, and to the heads of the different departments. He had the greatest satisfaction and confidence in proposing this vote of thanks, because he was sure the shareholders generally would recognize the skillful and judicious manner in which Mr. Oxnam and his colleagues had so far developed and were still developing their great property. (Applause.)

At an extraordinary general meeting of the shareholders of the Palmarejo & Mexican Gold Fields, Ltd., convened on the 30th day of May, 1905, to receive Mr. Thomas Henry Oxnam, of Los Angeles, the company's consulting engineer on his visit to London, it was proposed by Baron Boxall, seconded by Mr. Ehrlich, and resolved unanimously: That the thanks of the members of the company be tendered to Mr. Oxnam, for his valued and exceptional personal services to the company, 1901 to 1905, and as a special mark of appreciation the company

hereby votes him a bonus or grant of fifteen hundred guineas, to be paid to him irrespective of all other remuneration and in pursuance of a resolution of the directors to that effect. And it is further requested by the meeting: That a copy of the minute of this resolution be signed by the directors, and handed to Mr. Oxnam previous to his return to Los Angeles. Signed:

Thomas Southcott, chairman; E. J. Duval, Jno. Perry, Geo. Hallett, directors; Percy F. Gaunt, secretary.

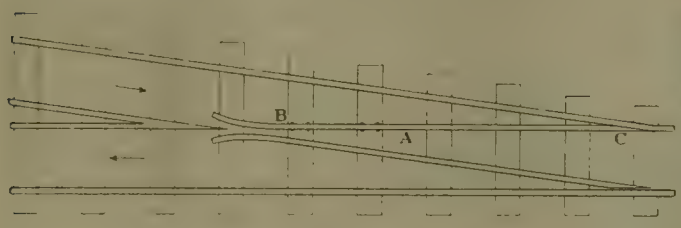
T. H. Oxnam.

Doble, Victorville, California, August 15.

The Spring Switch

The Editor:

Sir—I have read the description of the spring switch by S. S. Clarke, in your issue of August 20, and appreciate the ingenuity displayed in its construction. I have used a spring switch which will operate fully as well as that described by Mr. Clarke and which can be more simply and less expensively made. It operates by utilizing the elasticity of the rails themselves instead of employing an extraneous spring of any kind to readjust the switch points to position after the passage of the car or train. I have had such a switch as I here refer to built on a single-track tramway where a turn-out was necessary. It was arranged as shown in the accompanying sketch: designed so that cars could pass in either direction without stopping to throw the switch, thereby accomplishing all that the hickory-spring switch performs, with less trouble, and little likelihood of getting out of order. The switch is constructed as shown, the spring rail A being on the outgoing track, and extending from the frog to the rail as shown by B C. Only one rail is arranged to spring. This rail should be as long as possible, at least 12 ft., and if spiked too close to the point C, it may be too stiff to spring easily and in that case would probably derail a car. Where this switch is placed at a turn-out, as in the case mentioned, it is best to keep the outgoing line straight, as over this track the loaded cars pass, while the empties return on the outside curved track. In places where, for lack of room, a length of rail cannot be employed which will admit of the necessary amount of spring, the hickory spring will afford the desired means of automatically operating the switch. At the opposite end of the turn-out the spring rail would, as a matter of course, be placed on the opposite side of the main line, the outgoing loaded cars springing the switch point.



Superintendent.

Placerville, California, September 1.

A Cyanide Problem

The Editor:

Sir—In reply to Mine Owner's inquiry for a process for the treatment of auriferous and argentiferous ores containing antimony, it appears to me that the difficulty should not be insurmountable, always provided, of course, that the ore will stand the treatment charges. J. S. McArthur proposes a pretty process, consisting of dissolving the antimony—that is, when the antimony occurs as sulphide—by first leaching the ore with a solution of caustic potash, precipitating the antimony from the solution as sulphide by passing carbonic acid gas, and then revivifying the solution, ready for use again, with caustic lime. If there is no other deleterious content, the ore—now free from antimony—may be treated with cyanide in the usual way. This process is not applicable to ores in which the antimony occurs as metal. Antimony may be removed from an ore by roasting if a reducing agent such as coke dust be added from time to time during the process. During the roast, antimony sulphide or metal is converted into Sb_2O_3 and Sb_2O_5, which are volatile, and Sb_2O_4, which is fixed; the function of the reducing agent is to reduce any Sb_2O_4 that may be formed and would otherwise remain with the ore, to Sb_2O_3, which, being volatile, will pass away up the flues. An article of mine, that appeared in *Mining and Scientific Press* April 28, 1906, and was reproduced in T. A. Rickard's 'After Earthquake and Fire,' gave the results of a number of experiments, which may interest Mine Owner.

F. H. Mason.

San Diego, California, September 7.

No assessment work is required in Russia, and owing to that fact large mining claims may be held indefinitely without working, on the payment of a small annual tax. This has been regarded by many observers as one of the greatest obstacles to mining progress there. It has enabled many local merchants and small capitalists to play the dog in the manger and hold large numbers of unproved mining claims on the chance of a mining boom that will enable them to sell out at high prices. In this way hundreds of thousands of acres of promising ground is tied up. To meet this condition a clause was inserted in the last mining code providing for a supplementary tax on mining claims that were not being worked. This provision, however, raised a storm of protest, and the Duma, in accordance with the recommendation of the Minister of Commerce and Industry, has suspended the operation of this law until 1913. The representatives of the miners pointed out that gold mining was in a critical position and that any additional tax or restriction would injure it severely.

Concrete and reinforced concrete poles are now used for high-tension transmission lines, it being no unusual occurrence to carry lines with a difference of potential of 70,000 volts.

Concentrates

Most of these are in reply to questions answered by mail. Our readers are invited to use [illegible] any question dealing with the practice of mining, milling and metallurgy.

Reheating compressed air is often found to be a great advantage especially where the air has to travel a long distance to the point of consumption. A convenient method is to use a boiler for an air receiver, keeping a fire going in the fire box.

Dynamite should never be stored in underground workings longer than absolutely necessary and then in places especially prepared to keep it dry. It is customary in the larger mines to bring fresh supplies daily to the underground distributing stations.

The temperature of concrete in setting is to be determined at the Gatun locks by embedding thermometers in the concrete when it is poured. The thermometers will be of the resistance type, in which measurements are taken of the resistance of a wire to an electric current, and the temperature thus determined.

Bottles and glass jars may be cut off easily and cleanly with the tools found in any tin shop. First solder a strip of tin around the bottle at the line where it is desired to cut it. Then run the soldering iron around the bottle parallel to the tin strip. The bottom, or top, as the case may be, can then be easily broken off.

All spring bars, especially if they be of small cross-section, should be annealed before being shipped from the rolling mill. This is done by bringing them up to a full cherry-red heat in the furnace, 800°C., and allowing them to cool slowly after being maintained at this temperature for a sufficient time to allow of uniform heating.

The rating of air-compressors when expressed in the number of rock-drills to which they are capable of supplying air should not be made at a pressure of less than 80 lb. per sq. in. With a 3-in. drill this will approximate 130 cu. ft. of free air per minute though if a number of drills are being used it will be proportionately less as all the drills are not in operation at the same time.

A coal-dust burner using a jet of compressed air instead of a fan blast has been in successful operation for the past two years in a southern cement factory. Air at high pressure passes through a Koerting ejector nozzle and enters the kiln through a horizontal pipe. A vertical fuel supply pipe opens into the horizontal pipe just beyond the discharge end of the nozzle, and between the nozzle and the kiln, the rapidly moving air-jet carrying the coal dust into the furnace.

Of the 5,000,000 hp. theoretically available at Niagara Falls only 270,000 hp. or 5.4% has thus far been utilized. Of this 126,000 hp. is employed in electro-chemical processes, 56,000 hp. for railway service, 36,400 hp. for lighting, and 45,500 hp. for various industrial services. Nearly 12[illegible],000 hp. is transmitted to points more than ten miles from the falls. Of this amount 12,500 hp. is transmitted over a distance of more than 100 miles, while 53,000 hp. is transmitted between 75 and 100 miles.

Lead and mercury in the mercurous condition are precipitated from solution by the addition of HCl. The $PbCl_2$ is dissolved by hot water and confirmed by the addition of H_2S, H_2SO_4, K_2CrO_4, or KI. The mercury is identified by addition of NH_4OH which turns the precipitate black. Mercury in the mercuric condition is precipitated by passing hydrosulphuric acid in the warm solution and is separated from the other metals of the second group by the non-solubility of the sulphide in $(NH_4)_2S_x$ and in dilute HNO_3. The sulphide is dissolved in nitrohydrochloric acid and the presence of mercury confirmed by the precipitation of Hg on a copper wire or the reduction to Hg_2Cl_2 or Hg by $SnCl_2$.

Iron-portland cement is a hydraulic compound which consists of at least 70% portland cement clinker and, at the best, 30% granulated blast-furnace slag. The portland cement is prepared according to the definition of the German standard specifications for portland cement. The furnace slags are lime-alumina silicates. They contain at least 1 part by weight of lime and magnesia to 1 part by weight of soluble silica (SiO_2) + alumina (Al_2O_3). The portland cement and the slag must be ground finely. Additions for particular purposes, especially for regulating the time of setting, are admissible, limiting the amount, however, to 3% of the whole mass, in order to exclude the possibility of additions only for increasing the weight.

The flow over triangular weirs has been the subject of extended investigation by James Barr at Glasgow University. The investigations were undertaken in order to verify the formula $Q = cH^{2.5}$, proposed by James Thomson for the flow of water over a right-angled or V-shaped notch, and also to determine experimentally the values of the coefficient c in that formula. Mr. Barr says in *Engineering*, London, that the results verify Mr. Thomson's anticipation that the quantity is in almost all cases nearly proportional to the 5/2 power of the height of the still water surface above the vertex of the notch. The results also show that the prevention of the inward flow of the water at the sides of the notch, whether caused by the narrowness of the notch or by the roughness of the upstream surface produces an increase in the quantity over the notch. Experiments on a right-angled weir of very fine edge show that for heads of approximately 3 in. the coefficient c is about 0.3034; for heads of about 4 in. the coefficient is about 0.3020; for heads of 5 in., about 0.3014. For a notch in which the sides make an angle of 54°, thus giving an area of orifice half that of the right-angled notch, the coefficients for the different heads are slightly greater than half those for the right-angled notch. It is stated that the experiments were made with the aid of very delicate apparatus.

Special Correspondence

WASHINGTON, D. C.

J. A. Holmes, Director of Mining Bureau. — Report on Explosibility of Coal Dust.

Official Washington, which had all along been taking a keen interest in the candidacy of Joseph A. Holmes for director of the newly created Bureau of Mines, heard with great satisfaction that he had been appointed. A few hours after the news became public, both the President and Mr. Holmes were overwhelmed with telegrams of congratulations. Mr. Holmes took the oath of office on September 10. The temporary director, George Otis Smith, also Director of the Geological Survey, will return from Europe October 1. That Mr. Holmes is qualified by past experience is evident. He graduated at Cornell University in 1880. During his college course and since that time he has devoted special attention to studies in chemistry (with laboratory courses in the chemistry of explosives and of metallurgy), geology, electricity, and general physics, surveying, mining, and metallurgy. He has visited mining regions in many parts of the United States, in Germany, France, Belgium, and Great Britain. In these foreign countries as well as in the United States he has studied the methods of mining with special reference to lessening the loss of life and waste of resources. He was professor of geology in the University of North Carolina for ten years and in that capacity visited many mines in the professional way. As State Geologist for North Carolina for two years he gave much attention to an investigation of quarrying, metal mining, and metallurgical operations. In 1903 and 1904 he organized and had charge of the Department of Mines and Metallurgy of the World's Fair at St. Louis, planning the exhibits to show mining and metallurgical operations. In 1904, when the Government fuel investigations were authorized by Congress, the supervision was placed under a committee consisting of E. W. Parker, M. R. Campbell, and Mr. Holmes. Early in 1905, the latter was appointed by the Director of the Geological Survey to take charge of the investigations of fuel and of mine explosions, etc. When the Technologic branch of the United States Geological Survey was formed, he was placed at the head. In 1908, Congress appropriated $150,000 for a thorough investigation of the causes of mine disasters and this was added to his duties. In connection with his work during the last three years, Mr. Holmes has won the confidence and co-operation of both miners and mine owners throughout the country. Notwithstanding the fact that the work has only just begun, results of the investigations and educational work are beginning to appear in lessening the loss of life in the coal mines. In 1907, 3125 men were killed in the coal mines; in 1908, this had been reduced to 2450; in 1909, the deaths numbered 2412. In 1907, 145,471 tons of coal were mined for each life lost; in 1908, 167,545 tons were mined for each death; and in 1909, 186,567 tons were mined for each life lost.

The Bureau of Mines has just issued a bulletin on the explosibility of coal dust, with chapters by J. C. W. Frazer, Axel Larsen, Frank Haas, and Carl Scholz. The bulletin was prepared by the Technologic branch of the United States Geological Survey, and therefore will be known as Geological Survey Bulletin 425, but will be distributed by the Bureau of Mines. The author of the bulletin, George S. Rice, chief mining engineer of the Bureau, goes fully into one of the most serious and most perplexing problems that the coal mines have had to contend with in the last few years. He traces the growth in the belief in the explosibility of coal dust, summarizes the experiments and mine investigations that have established this belief and gives the present status of preventive measures. The following are some of the tentative conclusions of Mr. Rice: "That coal dust will explode under some circumstances, both in the presence of firedamp and without it, is now generally accepted by mining men. Experiments at Pittsburg indicate that under ordinary conditions the dust must be from coal having at least 10% of volatile combustible matter, though in certain foreign experiments, it is claimed, explosions were obtained with charcoal dust. Dusts with higher percentages of volatile combustible matter are more sensitive, ash, moisture content, and size being constant. This view is based partly on the preliminary experiments at Pittsburg and on the results of experiments of M. Taffanel and other foreign investigators. Where there is a large amount of dry coal dust, judging from the Pittsburg experiments, a humid atmosphere has little effect on ignition of dust or propagation of an explosion. A long continuance of the humid conditions renders the coal dust moist and inert, but the presence of moisture in the air at the moment of explosion is not sufficient to prevent an explosion; that is, not enough moisture is carried by the mine air to reduce materially the temperature of the flame. Fully saturated vapor at 65°F., an ordinary mine temperature in this country, weighs 6.78 grains per cubic foot (15.5 grams per cubic metre). Coal dust suspended in such a saturated atmosphere in a cloud of moderate density weighs, say, 200 grams per cubic metre. At the figures given the weight of vapor is but 7.8% of the weight of dust. The Pittsburg experiments with wetted dust showed that several times this percentage of moisture in the dust, in addition to a nearly saturated atmosphere, was required to prevent propagation. Probably with a low dust density, the relative humidity of the air would be an important factor in tending to prevent the initiation of an explosion. However, the great purpose of artificially humidifying mine air is that it may serve as a vehicle for carrying water to the dust." Mr. Rice concludes by reviewing the various remedies that are offered for the coal-dust problem, giving the good and bad points of each.

ANACONDA, MONTANA

Georgetown District.—Cable Mine. — Southern Cross. — Orofino.

Cable, Georgetown, and Southern Cross camps are all within two miles of each other, situated in a mountainous region twenty miles westerly from Anaconda, Deer Lodge county, Montana. In this vicinity is a chain of small lakes, the outlet of which flows toward Philipsburg. It is a gold mining district, where operations began in 1865, the gold-bearing ore occurring as pockets, shoots, and chimneys in limestone. The Cable mine, one of the oldest in the camp, is said to have a record of having produced $4,000,000 in free gold. The property is now owned by the Cable Lease Mining Co., in which H. C. and F. W. Bacorn, and associates, are in control. The property includes a 30-stamp mill, not now in operation, air-compressors, and all necessary equipment. A small force is employed on development and exploration work, mostly above the main adit which goes in 3000 ft. Within the last few years a great deal of diamond-drill work has been done as a means of exploring in new ground. The result is said to be that some good orebodies have been found, though they occur as pockets rather than continuous bodies. A 300-ft. winze, sunk from the principal adit, has resulted in opening some sulphide ore, including a little tellurium. Some tests are being made on the mill tailing with the view of cyaniding it.

The Southern Cross mine and mill are one and a half miles northwest from Cable, on the opposite side of a mountain divide. This property belongs principally to the H. L. Frank estate, though Lee Mantle and others have a considerable interest. As demonstrated by the development work, there are three principal north-south veins, about 150 ft. apart, within a zone of limestone. Those veins are known as the Southern Cross, Intermediate, and Trinity; besides, there is a well-defined chimney of ore on the group, known as the Pleades. The veins have a dip of 55°, and have widths varying from 20 to 100 ft. The ore runs approximately 12% silica, 55 to 65 oxide of iron, and 20 to 30 lime; and is claimed to average over $10 gold per ton. It contains some silver, amounting to less than $1 per ton. It is seldom that bodies of ore are found that are so thoroughly oxidized as these seem to be to a depth of over 300 ft. The mine is opened to a depth of 326 ft. by a

vertical shaft levels [illegible] which extend to the Southern Cross, Intermediate and [illegible] veins. And into the Pleades. The greatest amount of [illegible] appears to be on the Intermediate. On the third level of this vein there appears a body of ore 75 to 100 ft wide, from which it is said 200 cars of ore were shipped to the Anaconda smelter within the last two years. The ore stope on the fourth level of this vein is 60 to 100 ft wide and 300 ft long. It is stated the net value of the ore was $1.60 per ton. Similar ore is found on the other two veins, but much less in width. A 150-ft winze following the dip of the Southern Cross vein extends the ore from the 200 to the 300-ft level. The Pleades chimney is 40 to 60 ft diameter and is detached from the other orebodies. It has been opened from the surface to a depth of 300 ft on the dip. It contains a good grade of ore. Since January 1, 1909, 175 cars of ore have been shipped from the mine to the smelter, the proceeds having been expended for development. In making these shipments the better grade was selected, resulting in an average of $28.50 per ton. One carload, for which the highest grade was selected, had a gross value of $250 per ton. It should be stated that a number of large boulders of lime and shale occur within the veins and contain no metals of value. An unusual occurrence is a small lens of copper carbonate and copper glance on the second level, which sampled 10% copper, but no

shipper about $[illegible] per ton. Out of this however comes the wagon haul, charge of $[illegible] per ton. Since June 15 Mr. Dotson has shipped 45 cars and is now shipping a car every other day. In pursuing development and exploration a second ore shoot or chimney has been found about 200 ft. from the one from which ore is being shipped. F. R. Jackson and J. N. Durbin have taken a lease on the Pyramides tailing dump at Georgetown which they are treating by cyanide. The Revenue situated between Georgetown and Cable is under lease to H. C. Ernst and M. Benson who expect to ship ore this fall. Other lessees are making occasional shipments. The smelter pays 5c. per unit for the iron in the Cable district ores, which in some cases amounts to nearly enough to pay the treatment charge.

CHICAGO, ILLINOIS

Meeting of Lake Superior Institute. — New Officers.

Two hundred and thirty three members of the Lake Superior Mining Institute, celebrating the fifteenth annual meeting, reached Chicago by way of Milwaukee, August 25, at 11:30 a. m. Two special trains carrying the delegates were switched into the freight yards of the Sullivan Machinery Co., where the tour of inspection began. Here light refreshments were served, and after a visit through the plant automobiles were taken, through the courtesy of that company, for the trip over the West Park boulevards through Garfield and Douglas parks to the Ryerson plant, arriving at 1 p. m., where J. T. Ryerson & Son were hosts at an elegant luncheon followed by a tour of inspection of the plant. This 'iron and steel department store' is the largest in the world for the storage of machine and structural steel and specialties needed in the mining branches of steel construction and manufacture. It covers 750,000 sq. ft. of floor space and affords storage for 150,000 tons of material. Automobiles were then taken to the National League ball park, where the Cubs were seen in a contest with New York. After the game automobiles were taken to the train and the party left for Gary, Indiana, arriving at 8 p. m. The members pursued their way to Assembly Hall, where the second business session of the Institute occurred. The meeting was called to order with D. E. Sutherland in the chair. R. B. Woodworth read by title a paper on 'Underground Steel Construction, Particularly Mine Shafts,' and discussed the instability of wood as a material of construction and the evidence that steel is the most homogeneous material known. Charles S. Hurter then read by title a paper on 'The Proper Detonation of High Explosives,' and discussed from a mechanical and chemical standpoint the action of the explosives used today. The difference between high and low explosives was explained and the merits of Chile and India niter as a dope was compared. Mr. Hurter said that heat increased the sensitiveness of explosives and that when accidents occur it was generally due to increased sensitiveness caused by heat. He explained that shock and heat often combine to cause detonation, that if a drop of hot candle grease falling on a cap caused detonation it was due as much to the shock

Lake Superior Institute of Mining Engineers in Chicago.

similar ore has been found in the other parts of the mine. The plan is to sink deeper and establish two more levels. A mill, equipped with a crusher, rolls, Chilean mill, cyanide vats, and Moore filters, was erected four years ago, but after being started it was closed at the end of four months, and has since been idle. Present plans, however, contemplate the resumption of mill work. John Randall, of Denver, is on the ground making investigations with that object in view. It is estimated that there are 30,000 tons of ore on the dump, running $10 to $12 per ton, which may be treated. The operations are under the general direction of O. T. H. Allen, whose son is in charge of the underground work.

The Orofino mine, situated close to the Southern Cross, is being operated by Charles Bostrom, who owns a half interest and has a lease on the other half. The orebody here is in the form of a good-sized chimney in limestone, the apex of the orebody outcropping. It has been opened by a 300-ft. incline which follows the ore on its dip; also, by a 155-ft. vertical shaft, designed to be the main working shaft. A stope above the 100 ft. level has been carried 10 sets high, and 25 to 30 ft. wide, the ore from which was shipped to the smelter. The main body of the ore shoot seems surrounded by a rim of harder and lower-grade ore next to the limestone walls. Considerable work has been done from a lower level, showing similar conditions. The intention is to sink deeper, and it is probable that an electric hoist and an air-compressor will be installed this fall. The ore contains 26 to 33% silica, and 45 to 60 iron, with some lime and quartz. The iron is thoroughly oxidized. According to the returns from 20 cars of ore shipped to the Washoe smelter during August, the ore netted the

as to the heat, and that a capsule of copper had such a high heat conductivity that it made little difference whether the drop of hot grease fell on the fulminate or the capsule. Considerable discussion followed on the methods of packing detonators in boxes for shipment. The following papers were presented: 'Mining Methods on the Gogebic Range,' by P. S. Williams; 'The Mine Doctor', by E. M. Libby; 'Reminiscences of the Early Days on the Gogebic Range,' by Jon H. Herding; 'A Diamond-Drill Cross-Section of the Mesabi Rocks,' by N. H. Winchell, 'A Steel Head-Frame,' by Frank B. Goodman; 'The Newport Mine,' by Luther C. Brewer; 'Biographical Sketches,' by John H. Herding. Titles of other papers are to be presented later. The report of the council followed. Forty-six applications for membership were received, making a total membership of 553. A. J. Yungbluth, the secretary, stated that the fiscal year closed with $5000 in the treasury. F. W. Sperr then reported for the committee on nominations, and the following were unanimously elected: For president, W. J. Richards, Crystal Falls, Michigan; vice-presidents, E. D. Bryan, Chicago, Illinois, C. H. Munger, Duluth, Minnesota; managers, Peter Pascoe, Republic, Michigan, J. R. Cooper, Lake Linden, Michigan; treasurer, E. W. Hopkins, Commonwealth, Wisconsin; secretary, A. J. Yungbluth, Ishpeming, Michigan. On Friday, at 9 a. m., the party started on a tour of inspection of the Gary works of the U. S. Steel Corporation, the plant site of which covers 900 acres. They first visited the harbor slip which is 250 ft. wide and 5000 long. Vessels laden with 12,000 tons of ore are unloaded at the rate of 1250 tons per hour. Running parallel to the vessel slip and in line with eight blast-furnaces nearby, is a storage yard with a capacity of four million tons. After inspecting the blast-furnaces the party was led to the gas-engine buildings, where sixteen 2000-hp. gas engines operate the blast-furnaces and seventeen 3000-hp. gas engines drive electric generators. The gas for these engines is supplied from the blast-furnaces as by-product gas. Next came the open-hearth furnace rooms containing 65 open-heart furnaces. It is estimated that the Gary works will give employment to 12,000 men. In addition there have been reserved plant sites for the American Sheet & Tin Plate Co., the American Bridge Co., the National Tube Co., the American Car & Foundry Co., and the American Locomotive Co. In the afternoon the party returned to Chicago and at 6:30 attended a banquet in the gold room in the Congress Hotel annex at which the E. I. du Pont de Nemours Powder Co. acted as hosts.

MELBOURNE, AUSTRALIA

State Coal Mine.—Mt. Maroomba Boom.—Mt. Morgan.

The Victorian Government is pushing ahead with its experimental State coal mine at Powlett. The Railway Department is the great consumer for the coal and it is intended, when the mine is properly equipped, to hand it over to the Railway Department to run. The Minister of Mines wishes to be able to supply coal to the community at cost price regardless of profit. At present the whole public supply is obtained from the Newcastle field in New South Wales, and the average price of the coal delivered to the householder is about 25s. per ton. To the manufacturer or large consumer the cost is probably about 20s. per ton, and to the Railway Commissioners about 18s. per ton. The expectation is that the Railway Commissioners will be able to get Powlett coal for something like 15s. per ton. The Newcastle mines can supply at that price or even lower, but to do so would mean that the selling price, which has been raised by the combine controlling the industry there and by the Newcastle Miners' Association, will have to come down and with it the wages of the miner. It is not clear how labor is to benefit by any reduction in the price of Victorian coal, although unquestionably the householder will get vastly cheaper fuel if the Minister's ideas are carried into effect. The State has taken control of everything at Powlett. It will not sell any freehold in the mining township; consequently all the stores are being built on leasehold lots. Having got a taste of the State pap the people want roads, culverts, foot-paths, and sanitary requirements, all cared for by the State without cost to them. The miners have objected to the hewing rate of 3s. 6d. per ton fixed by the mine manager, but in that respect the Minister of Mines has been loyal to his officer. There was a rush from all parts of Australia to get employment in the State mine just as there is always a rush to get into the police force. It is early yet to say how results will turn out but they are being watched with the greatest interest. As a first step in the financing of this socialistic experiment the Government wants to write off £46,000 out of £90,000 already spent in the mine because it was 'emergency expenditure' to enable the requirements of the Railway Department of the Newcastle to be met during the strike. As the output of coal from Powlett during that strike was 4000 tons, the cost of the emergency rush was £11 per ton of coal—a nice price to pay when it was obvious to all that the field could not possibly produce coal until long after the strike was likely to be over.

Eastern Australia.

In this connection it may be of interest to give the Western slope of the United States the news that the miners are understood to be prepared to throw the coal mines there idle in September or November.

The mining world has had a sensation over the Mt. Maroomba field in the Northern Territory. The exact locality of that district is in what is known as Arnhem's Land on the western side of the Gulf of Carpentaria. The country is practically terra incognito, but in May last a couple of prospectors turned up in Melbourne with some rich samples of galena and a story of huge outcrops 500 ft. wide and thousands of feet long, rich in ore. Some of our mining men, attracted by the story, formed a prospecting company and sent up Andrew Wilson to inspect the area. The country is 300 miles from any settlement and a fortnight's sea voyage has to be taken from Melbourne to reach Port Darwin in the Northern Territory whence prospectors start. Long before Mr. Wilson reached the field people having friends at Port Darwin sent men thence to the locality. These got back to that town with even more booming statements of the richness of the field than those of the original prospectors. The big outcrops were there and the lead and the silver as well. So a market boom set in and £10 shares jumped to £185. Then the idea occurred to some people that after all Mr. Wilson might

but to so favorable an extent as the men who had made their way to the field proceed out camino and got shares in the companies formed. The prices then ruled so many time and a gradual stocking of prices took place. As it happened Mr Wilson did not approve of the field. In fact he advised his principal's to throw up their options. This advice coming from an independent source settled the market and the field. Shares dropped £10 in 24 hours and now are salable at £2 while most of the companies are thinking about winding up their affairs or of going farther afield. The truth is that the outcrops are huge masses of diorite with a little galena showing. There is also some limestone with galena but insufficient to make the district a mining field of the least promise.

The greatest mine in Australia today is without doubt the Mount Morgan, in Queensland. Gradually the oxidized ores are being exhausted and now instead of it being a purely gold mine of vast size it is becoming a great copper producer. The mine for the first time for many years has produced over £1,000,000 worth of product within the twelve months and it is certain that this output will be steadily augmented. The total output of metals from Mount Morgan since the inception of the company in 1886 has returned £16,026,924, and of this sum £7,479,167 has been distributed in dividends. The company now is about to start the use of a 2% copper fluxing ore from the Many Peaks field so that it will become still more important as a copper producer.

NEW YORK

Improved Conditions. — Copper Merger. — Copper Producers' Figures.—Giroux.

The week end holiday coincident upon the celebration of Labor Day was warm to suffocation throughout the East, with the result that those who were out of town postponed their return and the nominal close of the vacation season was emphasized by a lull in market doings more complete than in midsummer. There is a better feeling apparent, a belief that some partial resumption of activity must soon make itself felt. The material progress made in so many mining centres must prove a factor for the betterment of mining markets. The Eastern markets devoted to mining shares have not kept pace with the physical development of the properties in many instances, on the other hand there have been some cases of market movement not at all justified by mining progress or prospects. There is a steady improvement apparent in the mining share market in New York, when a survey covering a period of years is made. There is now all the necessary public interest; the elements that are needed is such publicity and assurance of good faith as will beget a proper degree of public confidence. The situation as to the general market is much mixed, the political agitation, important impending Supreme Court decisions, the possibility of drastic tariff revision, the evident over-extension of the automobile industry, the western-land speculation and the consequent tying up of bank funds in real estate, are all elements which have vital effect upon the market and upon the financial atmosphere. The assurance of a fairly abundant crop is offset in large part by the increasing cost of necessities, so that this fundamental factor does not control in face of the adverse elements which make the future uncertain and effectively forbid the present launching of new constructive enterprises.

The copper merger would have been completed months ago had it not been for the unpropitious outlook. The stumbling blocks in the way of the copper merger were possibilities rather than actualities, but none the less effective. That the scheme is now being gradually worked out is quite apparent. The dissenting minority in Cumberland-Ely withdrew their opposition to the consolidation with Nevada Consolidated, and the final dividend checks in liquidation of the company, being $6.16 per share, have been distributed. The announcement is now made semi-officially that the Utah Copper Co. has acquired in the open market enough stock of the Nevada Consolidated to give the latter absolute control. James Phillips Jr. president of the company who waged a fierce war last winter against the proposed consolidation and succeeded by a narrow margin in preventing its consummation will undoubtedly find himself in the minority when the Utah Copper people again reach out for Nevada Consolidated. While there is a truce prevailing between the Utah Copper-Anaconda Smelting & Refining interests and the Anaconda International Smelting & Refining companies, and common cause is made in instituting a curtailment of copper output there is nevertheless to be seen the quiet strengthening of an outpost here and there and the unostentatious alignment of hitherto wholly or partly independent factors. For instance Roscoe H. Channing is assuming the duties of consulting engineer for the Utah Con., one of the principal Standard Oil properties. Utah Con has broken away from the American Smelting & Refining Co. and the Tooele plant of the International Smelting was built largely to handle Utah Consolidated ores. This alliance is not new, but the fact that R. H. Channing is to utilize a portion of his time in behalf of the General Development Co. marks a harmony between the latter and the Standard Oil forces, which is confirmed and emphasized by the recent news that the Miami concentrate, from the new mill to be started January 1, instead of going to the Copper Queen smelter at Douglas as was reported some weeks ago, is to be shipped to the Greene Cananea plant in Sonora, Mexico, for treatment. The old Greene Consolodated plant has been almost completely rebuilt, and on the present copper market the Greene-Cananea management may be well content to employ the smelting plant on outside ores. This contract marks a closer relation between the General Development Co. and the Cole-Ryan Amalgamated Copper-Standard Oil family. The General Development Co. is to make Miami its first big copper producer, but it controls several others, among them the New Keystone and the New Planet; all of these must now be counted as a part of the phalanx arrayed against the Guggenheims. Whether the battle in the end is to be fought out in the open markets or in the private offices of the bankers remains to be seen, but the real question as to who is to dominate the copper market, and who is to be the world's largest smelter man has not been decided. The moves in the struggle are interesting and the attack and defense are like a Brobdignagian game of chess. When Heinze was standing the State of Montana on its head and entangling the camp of Butte in lawsuits until it resembled a procession, marching through the financial district of New York enmeshed in miles of 'tape' thrown from the windows of skyscrapers, it was said that every lawyer, politician, and miner was branded either with 'kerosene' or 'pickles.' Apparently some similar distinguishing mark will soon be necessary to designate the status of nearly every copper property in the country, save those controlled in Boston.

The August figures of the Copper Producers' Association were expected to give something of a line upon the effectiveness of the recent restriction of output. It is really too early to expect such results to show in refinery figures, from which sources the association collects the greater part of its data. Next month's showing will be a much better criterion. For August the production was 127,803,618 lb., as against 118,370,003 for July, and 127,219,188 for June. From the figures given it will be seen that the July output was under the normal, though the curtailment policy was not at that time actually in force. The proper analysis would consider August output as representing more largely the mine output of June. This does not apply, of course, to figures covering individual mines or smelters, like the monthly production of Butte, for instance, where the exact tonnage of the various mines is known. The total consumption for the month of August was 129,563,051 lb. The decrease in the sulplus was, therefore, 1,759,433 lb., being the first decrease registered since April. The heavy export demand was the chief factor in the reduction of accumulated stocks; the output being divided, 67,731,271 lb. for domestic consumption and 61,831,780 for export. Only three times during the current year has the export demand ex-

ceeded 60,000,000 lb. for any month: in January exports were 81,691,672 lb.; in June 65,895,948. Taking into consideration the record figures in production, the principal sellers of copper metal report themselves as fully satisfied with the present showing, holding that in sixty days the restriction of output will make itself felt and that then the market should be considerably firmer. In the meantime, so long as the present rate of consumption is maintained, the situation is improving somewhat. At the meeting of the Copper Producers' Association, James McLean, of Phelps, Dodge & Co., Inc., was elected chairman of the Association, is place of T. L. Livermore, whose recent retirement has been noted. Mr. McLean's place on the executive committee of the Association was filled by the election of Rudolph Agassiz, of the Calumet & Hecla. J. D. Ryan, recently returned from Europe, has gone to Butte and is looking after the working of his plans for cultailment formulated at the London conferences, in which he took a prominent part. Butte is to curtail 15%, but is to keep all miners working hoisting a lower grade of ore. Some economies, put into effect since the Butte merger, permit of this being done without cutting profits. Butte costs now average 9c. The production of the two smelters of the Anaconda is to be kept at about 270,000,000 lb. per annum, while the mines are to be put in shape for increased production should the metal market justify it. The Federal Government is making an effort to end the smelter-fume trouble in Montana, and George W. Wickersham, U. S. Attorney General, is in Butte to make a personal examination at the smelters, in connection witn the equity proceeding brought by the Government against the Anaconda Copper Company.

One of the interesting developments of the mining situation is the growing recognition of the right of the stockholders and the public to know something of physical and financial conditions. The Cole-Ryan management was under fire in regard to North Butte until a statement was forthcoming. The same interests have recently had to come into the open in reference to Giroux. Giroux was expected to begin shipments about September 1, or when the Tooele smelter was blown in, but nothing was done nor was any report made public. The market has noted a good deal of selling pressure in Giroux, and the impression gained ground that some of the selling was for company account. The management has now seen fit to take the public and the shareholders into its confidence, in the statement that the company has no occasion to go into the market directly or indirectly. As to the physical conditions, it is stated that the old Alpha shaft of the Giroux, sunk in the limestone, is altogether unsafe; that the new five-compatrment shaft is now down to the 1200-ft. level and is to be sunk to the 1400-ft. point. From each of these levels drifts are to be run to the ore partly opened in the Alpha shaft.

LONDON

Carn Brea & Tincroft.

One of the famous companies working tin mines in Cornwall, the Carn Brea & Tincroft, has arrived at another crisis, and additional capital must once more be provided. For many years the ore has been too poor to yield substantial profits, let alone provide funds for expansion and development. For some time it has been acknowledged that a liberal supply of new capital has been required, but the necessary steps to meet the situation have been postponed owing to the inauspicious circumstances connected with Cornish mining. In addition, the discoveries of higher-grade ore a year ago enabled the company to increase its output considerably, and the directors hoped thereby to weather the storm for the time being. However, the grade has once more fallen and the situation becomes acute. To have an independent opinion of the position of the property and its prospects, the directors asked R. Arthur Thomas, of Dolcoath, to make a thorough examination. His report is appended to the directors' report for the past half-year now issued. During the half-year under review 38,797 tons of ore was raised and 491 tons of tin concentrate was produced. During the corresponding period of 1909, 36,825 tons of ore yielded 568 tons of concentrate. The relative production per ton was 34½ lb. a year ago and 28⅓ lb. during the first half of 1910. The relative amounts realized and the prices per ton were £39,428 and £37,145, and £69 and £75. Sales of other products, arsenic and wolfram, brought the total income to £39,652, and the expenses were £40,157. Lords' royalties amounted to £1422, so that the loss for the half-year was £1927. During the last ten years, the only time when anything like satisfactory profits were made was during the boom from the middle of 1905 to the middle of 1907; before and since the balance has generally been on the wrong side. Another disadvantage under which the mine labors is the absence of modern dressing plant for removing wolfram; consequently the price obtained by the sale of concentrate is lower than the average received for Cornish produce. The amount of available cash capital is now less than £5000. Mr. Thomas' report begins by a review of the history of the property and shows that since 1896, when limited liability was adopted, £132,000 has been raised and spent on the four mines, Carn Brea, North and South Tincroft, and Cook's Kitchen. Of this sum about £100,000 has been spent on development; £5000 on new surface plant, a similar amount on repairs and renewals, and the remainder has gone in wiping out adverse balances. During the fourteen years the developments have amounted to 28,400 ft. or double what was expected would be necessary; nevertheless it was never possible to keep development much ahead of mill requirements. The only time when sufficient profits were made to provide a dividend was in 1906 when about £4000 was distributed on the preference shares. The company has the disadvantage of having two lords who own the mineral rights. The Basset estate owns Carn Brea and Cook's Kitchen, and the Clifden estate North and South Tincroft. At the present time the production is distributed thus: 19% from Carn Brea, 43% from South Tincroft, 38% from North Tincroft, and nothing from Cook's Kitchen. Each mine has its separate stamps and dressing floors. The crushing plant consists of old Cornish stamps amounting in all to 244 head, of which 96 are at Carn Brea, 88 at South Tincroft, and 60 at North Tincroft. As the Carn Brea output is not sufficient to keep more than half its plant in operation, some of the ore from the other two mines is mixed with it. It happens that Carn Brea and South Tincroft ores are fairly clean, but that from North Tincroft carries much wolfram, arsenic, and copper, as well as tin. Mr. Thomas animadverts on the policy of mixing these ores in treatment and makes the suggestion that in future the North Tincroft ore should be treated separately and a magnetic separator introduced for the removal and recovery of the wolfram, as is done at other mines in the neighborhood. Such an alteration in treatment would not cost more than £2000, and the immediate result would be the production of high-grade concentrate from Carn Brea and South Tincroft, that would command a better price than at present; the eventual profit to be obtained from the North Tincroft ore cannot be exactly gauged until expirements have been made. Mr. Thomas would also scrap the whole of the stamps and the buddles, if the reserve of ore warranted the expense of new plant; but the mines do not warrant so great an expenditure at surface at present. No work has been done at Cook's Kitchen for some years. The shafts, however, are kept in good state of repair and the water is not allowed to rise above the 2100-ft. level chiefly for the benefit of the other mines. The cost of pumping is heavy, amounting to £15,000 per annum, a figure which does not include any allowance for depreciation or a share of general expenses. Mr. Thomas describes the state of the various workings and comes to the conclusion that the present rate of extraction can be maintained for some time; in fact, in South Tincroft there are bodies of ore that could be more extensively worked than at present. He is of opinion that the duty of the stamps could be increased, and more ore treated, and he also points out that a better selection of the ore going to the stamps could be made by more efficient removal of waste.

General Mining News

ARIZONA

COCHISE COUNTY

The top workings of the Ritas shaft of the Superior & Pittsburg Copper Co. at Bisbee have been closed down and the ore tributary to this outlet will be handled through the Hoatson. The laying off of a few surface men does not indicate that there will be any curtailment of work underground and development will be carried forward as in the past.——The Cochise Gold Mining & Milling Co., operating twenty-six miles east of Benson, has opened a shoot of free-milling ore 15 ft. wide.——A churn drill has been taken to the Great Western property in the Courtland district and prospecting with it will be started at once.——The face of the adit at the Bernoudy group at Paradise is entirely in ore that is worth about $8 per ton and it is expected that the grade will improve considerably when the contact with the limestone is cut.——Assessment work has been started for the year on the Sweeney group.——After a year of continuous work the lowest level of the Tombstone Consolidated property has at last been unwatered and the pumps there are now in order to hold their own against the flow. The old drifts are being opened and new development started to block out the ore necessary to keep the 40-stamp mill in operation.——A body of ore assaying as high as 47% zinc and 17% lead has been opened on the group of claims in the Huachuca mountains owned by G. J. McCabe, L. C. Shattuck, and Frank Johnson.

GILA COUNTY

(Special Correspondence.)—Development at the Arizona Michigan property in the Globe district for the past month has been satisfactory both from the standpoint of speed and exploitation. On the foot-wall side of the vein in the Telfair cross-cut a winze has been started which is down 13 ft. At the same time it was decided to drive both ways on the foot-wall side of the vein from the cross-cut. These drifts have progressed 20 ft. or so on either side. The Telfair cross-cut is out 1246 ft. from the shaft.——Monthly development for August underground at the Miami mine has amounted to 1000 ft. approximately which is about one-quarter of the amount during the active exploration of the mine. There are about 40 men employed in the workings on and above the 420-ft. level and a portion of these are completing the concrete work and the reinforcement of the underground ore-bin at the shaft.——The development in the McGaw shaft at the Superior & Boston property has taken it to a depth of 831 ft. which is 11 ft. below the point where the station will be established. The shaft has been discontinued for the immediate present and all attention is being directed in the construction of the station on the 820-ft. level.——As soon as the station is completed, sinking will again be started and coincident with this a cross-cut to the Great Eastern vein will be driven.

Globe, September 10.

MOHAVE COUNTY

The Little Jimmie group in the Union Pass district has been sold to Los Angeles interests by James Dundon.——T. B. Scott, who is interested in the Lucky Boy and Bright Days properties in the Chloride district, is inspecting the mines and it is probable that work will be resumed on the groups at an early date.——H. M. Bowen has made the third payment on the Belleflower mine to Rothe & Oleson and will resume operations. The shaft will be sunk to a depth of several hundred feet and the vein prospected.——A cross-cut on the 350-ft. level of the Pilgrim mine has been completed which opened a body of free-milling ore on the foot-wall of the vein.——The work of sinking below the 300-ft. level of the C. O. D. mine is well under way and the old works which contain a large amount of ore will soon be tapped and drained.——An $18,000 bar of bullion which represented the clean-up from a six days' run was forwarded a few days ago from the Gold Road mill.——The group owned by Hoskins & Warner in the Secret Pass district is being sampled for Colorado interests.——The shaft at the Cyclopic mine is down 100 ft. and cross-cuts are being driven to intersect the veins between which the shaft was sunk.

PINAL COUNTY

(Special Correspondence.)—The property of the Howard Consolidated Mining Co. in the Vekol mountains south of Casa Grande has been sold to Flinney & Brooks of Los Angeles. The adjoining Republic group also has been acquired and the Vekol Range Copper Co. organized. Title to both properties has passed to the new company, the officers of which are Charles E. Flinney, president, and Robert J. Simpson secretary and treasurer. The claims have been operated at various times since 1881 and a large amount of copper ore has been extracted and smelted at the property.——Flinney & Brooks also have acquired 15 claims adjoining the property of the Ball Copper Co. in Gila county.——The London Shamrock Co. has been organized to take title to the property. The Ball Copper Co. of Arizona, which now owns the Pivot group adjoining the London Arizona, has contracted to purchase a controlling stock interest in the Vekol Range Copper Co., and the London Shamrock Company.

Casa Grande, September 10.

YAVAPAI COUNTY

The Logos mine, eight miles southeast of Mayer, has been taken over by L. D. Hall and a force of men started on development. There is a 180-ft. shaft, another 100-ft. deep, and a 200-ft. drift on the property, together with a hoist and camp buildings, so no time will be lost in making surface improvements.——A 20-hp. gasoline hoist has been installed by the Swastika company which owns the Black Prince and Warrior claims and a large amount of development is planned under the supervision of F. W. Wood.

YUMA COUNTY

The King of Arizona mine at Kofa, the control of which is owned by Eps Randolph and E. S. Ives, has been closed down as the ore, which has made the property one of the best producers of that district for the past ten years, has become too low grade to put through the mill.——The shaft at the Silent King property has opened a number of rich stringers in the vein and ore assaying as high as $2500 per ton has been obtained.——All the construction work has been completed at the Clara Consolidated and the construction crews laid off. Development will be carried forward on a larger scale as a new hoist has been installed at the No. 5 shaft and sinking is being hurried.

CALIFORNIA

AMADOR COUNTY

The shaft at the Lincoln mine has been retimbered to the water level and an electric pump installed. Work will be continued in the shaft as fast as the water is removed.——A head frame is being erected at the Rose claims and development started.

CALAVERAS COUNTY

N. B. Harris, of Montclair, N. J., has purchased the Lightner mine at Angels Camp for $200,000, and will spend $50,000 in development, the work to be started at once. The property has been examined by F. L. Lowell under the direction of Francis Drake, W. G. Devereux, J. R. Farrell, R. C. Shaw, and A. M. Yonge who estimate 500,000 tons of ore in sight. The mine has a record of $650,000 disbursed in dividends during the past ten years under the management of Alex Chalmers, who will continue in charge of the mine.——There is 20 tons of ore on the dump at the North Star mine near West Point and the shaft is down 45 ft.——C. Gilbertson has opened the vein of the Morning Star claim on the 10-ft. level showing it to contain a high percentage of sulphide.——A shipment of 50 tons of first class ore has been forwarded to the smelter from the Newman mine and about 150 tons of second class piled on the dump.——Machinery is being placed on the Star of the West property by Stanley Barnhart and the shaft will be reopened.——Operations have been resumed at the Buena Vista group.

INYO COUNTY

A report has been mailed to the stockholders of the Casa Diablo Mining Co. stating that the company has approximately 50,000 tons of ore blocked out and that new machinery has been ordered to facilitate the handling of it. An examination of the property has just been completed by A. L. Carter who recommends the development of the lower levels of the mine and the installation of a cyanide plant.

KERN COUNTY

Well No. 56 of the American Oilfields Co. in the Midway district which was brought in about a month ago has commenced spouting at the rate of 15,000 bbl. per day.——The Consolidated Midway's well No. 1 is being held down to a production of about 30,000 bbl. per day although the well is capable of producing nearly double this amount.

LOS ANGELES COUNTY

At the meeting of the Western Oil Producers' Association held at Los Angeles September 8, S. C. Graham, the secretary, resigned as the majority of the directors elected were opposed to the conservation policy approved by Mr. Graham.

MARIPOSA COUNTY

The Marble Springs Mining & Milling Co. has secured a bond on the Marble Springs mine, near Coulterville, and will unwater the property which has a good record for past production. The company, for which F. M. Bernou is manager, has also taken the adjoining North Fork group of 14 claims under bond. There is a 10-stamp mill on the latter property.——Teamsters are busy hauling the machinery from the Mt. Jefferson mine near Groveland to the Hites Cove property.

NEVADA COUNTY

The Pittsburg Gold Mining Co. has commenced sinking at the 1150-ft. level of the shaft and will continue to the 1350. The company is using electric power for hoisting so there is little likelihood of any interruption to this work due to the shortage of water though the water company has announced that the supply is running short.——The Tarr Mining Co. is constructing a large dam east of the Prudential mine that will hold a supply of water for the mine. The tailing from the sluicing will be raised by a hydraulic elevator and run behind restraining dams.——The adit on the property of Otto Woehler, at Spenceville, has opened a 10-ft. vein of copper ore and a number of samples have been shipped to determine the value of the discovery.

PLACER COUNTY

S. D. Valentine and J. L. Bryson have been examining the Big Oak mine near Colfax with a view to reopening the property which has not been worked for about fourteen years.——The drift has been completed across the front channel at the Red Sea gravel mine and has been started toward the back channel.——Good ore is being opened on the 100-ft. level of the Three Queens mine by M. Savage who is developing the property.

SIERRA COUNTY

Development has been resumed at the Kate Hardy and a drift is being driven on one of the lower levels to get under the rich shoot that was opened a short time ago.——J. G. Jackson and P. W. Smith have secured a bond on the Brown Bear, Brown Bear No. 2, and Brown Bear Tailing claims and are driving the adit to tap the gravel. Orders have been placed for 2000 ft. of steel rail and 1000 ft. of air-pipe.——Davies & Fippin have opened a shoot of ore, samples of which assayed as high as $1000 per ton, on their claims near Mountain House. An adit is being driven to tap the vein at greater depth.——High-grade arsenical pyrite has been opened at the Cremorne mine about five miles from Alleghany.——S. W. Van Syckel has secured a bond on the Hayes mine near Sierra City and has commenced development under the direction of William Barker. The Hayes was one of the early-day producers of this district and is equipped with a 20-stamp mill. A new compressor and air-drills will be installed at once to hurry the work of development.——A track has been laid to the mill at the Empire mine in Gold Valley and the ore is being crushed.——Machinery for the electric-lighting plant at the Bunker Hill mine has arrived and is being installed at the property.——Charles Brown has stopped work in the shaft at the Code property and will drive an adit that will tap the vein at a depth of 400 ft. It is estimated that it will take 600 ft. of driving to complete this work. The vein in the bottom of the shaft is 28 in. wide and assays $13 per ton.

SISKIYOU COUNTY

The Highland mine near Etna Mills has been sold and the new owners are to spend a large amount on development and the erection of a mill.——Several sacks of high-grade ore has been shipped from the Overton mine for treatment and it is reported that this property is developing one of the best shoots in the Russian Creek district.——A new company has taken over the management of the Wright & Fletcher placer property and will install new apparatus under the supervision of Charles Fry.——Gardner & Weed made the final clean-up on their placer claims for the season with excellent results.

TRINITY COUNTY

The Trinity Dredging Co. has a crew of surveyors running a line for the ditch that is to convey the water for the power plant and dredge. A fall of 280 ft. will be obtained and nearly 1000 hp. developed. The company owns 850 acres of land and has ordered machinery for the equipment of the dredge and plant.

TUOLUMNE COUNTY

(Special Correspondence).—A discovery recently made in the Sunny South mine, two miles north of Tuolumne, has revealed facts which will likely involve the property in litigation. An option for a bond was given to C. E. Connally by the owner, L. Bacigalupi, of Sonora, who subsequently bonded the property to other persons at a great advance on the original sale price, and both parties now claim right to possession. The ore was opened not far below surface. The vein is 9 ft. wide and will average, in its entire width, not less than $10 per ton.——The Central Mother Lode Gold Mining Co. has made final payment on the Mangante mine, situated near Jamestown. The company has extensively developed the property, which is now rated among the most promising in this county. It is reported that the company will be reorganized, with a greatly increased capitalization, and that operations will in the future be conducted on a much larger scale than in the past. Machinery is to be purchased at once to handle the flow of water in the mine, which of late has become unusually large.——It has been repeatedly rumored that negotiations involving the sale of the App and Rawhide mines had reached a successful conclusion and that the new owners would shortly assume charge of the properties, but as yet nothing certain or definite has come to light.——Mining operations have been suspended for a few days at the Harvard in order that the necessary annual repairs may be made. The Harvard is not affected by the shortage of water, as it gets its supply from the Gale ditch, which is fed by springs which flow the year round.——Several men are employed in putting up a 4-stamp mill at the Italian Camp mine, situated one mile west of the Belleview and owned by Andrew McCormick, Joseph Rolleri, and John Froli.——The Empire mine, on the same vein as the Providence, and formerly known as the McKinley, is being unwatered for thorough inspection. The property was recently bonded to L. H. Jansen, whose intention is to install the necessary surface equipment for its development if the showing proves satisfactory.——The crew which is sinking the Longfellow shaft is to be increased to 18 men and it is the intention to go down 1000 ft. before driving new drifts.——The Volich mine, on Bald mountain, has been leased to J. J. Barkla and E. Stephens, who have commenced work at the property.——A brief suspension of operations was caused at the Mack mine by the breaking of the compressor shaft, but there was no unnecessary delay in the resump- of work.

Tuolumne, September 12.

COLORADO

CHAFFEE COUNTY

V. J. Barrett and J. J. Evans of Pueblo, leasing on the Moose mine, recently made a rich discovery of gold and silver ore. Assays have run as high as 2½ oz. gold and 60 oz. silver, but the average value is between $125 and $200 per ton. A shipment is now being prepared and will be sent to the Eller smelter in a few days.

CLEAR CREEK COUNTY

(Special Correspondence.)—Work on the Ruler property was put under way the first of this week. N. Williams, who has been appointed manager, states that the adit will be driven for 500 ft. to intersect a number of cross veins that are owned.——Work has been resumed on the Paragon adit, situated at the head of Bard creek. E. L. Clark of Minneapolis is manager.——The Santiago mill and sampler was completely destroyed by fire on the night of August 30. William Rogers, the manager, states that the building will be reconstructed and that the new mill will be one of the most modern constructed in Clear Creek county.——Arrangements have been perfected whereby the Rosebud property on Democrat mountain will be developed. The two adits will be driven ahead for several hundred feet.——The buildings at the Oriental adit on Bard creek have been completed and a force of men is employed driving the adit. A group of seven claims is controlled. A. Swanson is manager.——Work was resumed last week in putting through the raise from Victoria adit level to connect with the Frostberg workings. It will be necessary to break 200 ft. of ground before the undertaking has been completed.——F. Rowan, in charge of the installation of machinery at the Malm electro-chemical plant, has received orders from the Western Metals Co. to have the plant ready for ore treatment by November 1. As a result it will be necessary to work night and day henceforth. The East Griffith mine is receiving large development, due to the contract that is held with the Western Metals Co., wherein 50 tons per day of lead-zinc ore must be furnished.

Georgetown, September 9.

GILPIN COUNTY

(Special Correspondence.).—The Star of the West mine in Russell gulch has been taken under bond and lease by T. M. Fisher of this city who has interested a number of investors. The property adjoins the War Dance, one of the heaviest producers in the county. Driving has been started from 330-ft. level of the shaft.——The Benzal at Black Hawk has been leased to H. Boellert and H. Hartman. The water is being raised from the shaft to the 240-ft. workings and development will be started from both the 100 and 240-ft. levels. The mine was a former heavy producer.——The Stewart mine in the Wide Awake district has been secured by Eastern men and work will be put under way soon.

Central City, September 10.

LAKE COUNTY

The lessees of the McRea shaft on the north side of Fryer hill, at Leadville, have unwatered the mine and are now cleaning out the old drifts preparatory to starting development.——A. Johnson and associates have completed 200 ft. of driving at the Lime property and are now preparing to ship the ore which is a good grade of iron.——The lessees of the Little Giant are working through the Yankee Doodle shaft and shipping 50 tons of ore per day.——A company has been organized to drive a long adit that will have its portal in Birdseye gulch and cut a number of veins at depth on that side of the mountain. The company, at the head of which is S. P. Fenton, will install an electric air-compressor and equipment for driving the adit 3000 ft.——The output of the Leadville district for August amounted to 74,000 tons which is an increase of 10,000 tons over July, and it is estimated from the present rate of production that this month will make a similar advance as a number of properties are preparing to commence shipment.——The new shaft at the Blanche in South Evans gulch is going down steadily. A seam of ore of good milling value was cut recently.——A heavy flow of water has been met at the Favorite and pulleys are being installed to handle it.

OURAY COUNTY

The winze from the 400-ft. level at the Frank Hough property has opened the vein about 100 ft. below the level and assays have been taken which run 40% copper, 50 oz. silver and $10 gold per ton, which is somewhat better than obtained in the levels above. Since opening the vein at this point there has been considerable talk of resuming work in the deep adit which was started to cut the ore at a depth of 1000 ft. This would bring the ore out just above the San Juan Chief mill.——Patrick Cobbles and Alex. Gould, who secured a lease on the Oom Paul group a few weeks ago, have shipped a carload of ore that is worth about $80 per ton in gold and silver.——The raise from the Bagley adit at Animas Forks to the Red Cloud shaft has been started, the total distance amounting to 600 ft. This raise will open a large amount of ore on the Red Cloud vein.

TELLER COUNTY

A contract has been let by the El Paso Consolidated Mining Co., at Cripple Creek, to drive a raise that will intersect the churn drill hole from the bottom of the El Paso shaft. The raise will be driven the same size as the shaft so when the water is drained the two may be connected and used as the main shaft of the property. The distance between the bottom of the churn drill hole and the cross cut is about 300 ft. and it is estimated that by working from above and below this can be completed within a month.——The Union Leasing Co. has secured a three years' lease on the property of the Gold Sovereign Mining & Milling Co. and will take over the property from the Clements Leasing Co. which is now operating the mine about the middle of December.——September 10 was pay-day at Cripple Creek and it is estimated that $350,000 was distributed.——Two good discoveries have been made by lessees on the property of the Gold King Mining Co. in Poverty gulch within the last few days, ore being obtained that assayed as high as $1000 per ton.——Work is progressing rapidly in the retimbering of the incline shaft and the construction of mine buildings at the Last Dollar mine which is under lease to the Uncle Sam Mining & Leasing Co.——The Altman Leasing Co. has opened a body of rich ore on the 450-ft. level of the Pinto claim.——Iver Weston and associates have cut five feet of $40 ore on the Lexington company's ground.

IDAHO

IDAHO COUNTY

The second payment on the Center Star mine, in the Elk City district, has been made by the New York interests that have been developing the property since June 1. A crosscut is being driven to tap the vein considerably north of any of the present workings.——There is a small force of men at work at the Grangeville getting the property in shape for the arrival of the new machinery.

SHOSHONE COUNTY

Reports from the smelter on the second car of ore sent to the smelter from the Reindeer mine, at Mullan, show a net return of between $600 and $700. Some of the ore is stated to have assayed about 20% copper. The first car netted $200. The company has decided to erect a mill to treat the ore.——Sufficient high-grade galena ore has been taken from the Cedar Creek mine, near Murray, to make a carload shipment. Much concentrating ore has also been taken out. The excellent showing of lead ore continues. One raise was made in the shipping ore and a second raise is being driven.——Peter Vannetti, and associates, lessees of the upper workings of the Callahan mine in the Coeur d'Alene district, who shipped six cars of galena ore this summer, are preparing to double their shipments. A steam-drill plant has been installed at the mine which has shipped 29 cars of ore to date.

MONTANA

CASCADE COUNTY

In line with the present policy of economy the Anaconda

Copper Mining Co. is making some important changes in the smelter at Great Falls. The blast-furnaces are to be made larger and new reverberatories of the Washoe type installed. For some time the Anaconda company has been experimenting at the Washoe plant with Montana coal and deep fires to take the place of shallow fires and long flames produced by the Diamondville coal. The results have been satisfactory and it has been found that Montana coal, with deep fires, will do as effective and economical work as the shallow fire and Diamondville coal. While the use of

Great Falls Smelter and Chimney.

Montana coal will not work any saving, it is an achievement to be able to use Montana coal exclusively. Hereafter a direct fire will be used. With the changes being made at the Great Falls plant the capacity will be increased about 30 per cent.

NEVADA

ESMERALDA COUNTY

(Special Correspondence).—The merger of the Rawhide Queen and Rawhide Coalition has been satisfactorily arranged and the next step will be the erection of a modern mill and cyanide plant to treat the large tonnage of ore that has been blocked out in the properties. The leases will be taken up by the management as soon as possible and the entire property operated on company account.——The Federal Mines & Reduction Co. is sinking its shaft to the 300-ft. level and will open much new territory. The mine is equipped with a hoist capable of sinking 700 ft. and it is expected to complete the installation of a cyanide plant at an early date.

Rawhide, September 9.

HUMBOLDT COUNTY

(Special Correspondence).—The new mill of the National Mining Co. is ready to receive power, and will probably be in operation soon. It is understood that the shipments during August approximated $300,000. An immense quantity of ore, averaging about $5 per ton, has been stored on the dumps for treatment in the new mill.——The Causten lease reports the intersection of the Charleston Hill vein eight feet from the shaft. The ore was struck on the 100-ft. level the gold and silver values being about equal.——The Charleston Hill company has granted a lease to the Green Leasing Co. of Salt Lake, and one to William Thompson, of Goldfield. The Bankers lease is expected to strike the vein within a short time. The Defiance lease, also on Charleston Hill estate, is sinking steadily.——In the Mayflower the 500-ft. adit has intersected seven feet of ore

Winnemucca, September 9.

LYON COUNTY

(Special Correspondence).—The management of the Mason Valley mine has decided to construct a gravity aerial tram from the mouth of the present adit, No. 4, to the railroad, a distance of 1¾ miles with a drop of 600 ft. in elevation. The Nevada Copper Belt railroad has completed its track to the head of Mason valley, and has graded to the smelter site east of Wabuska, where excavation work is in progress. The Mason Valley is contemplating using a diamond-drill to explore its vein at depth. ——The Nevada Douglas has made another $50,000 payment on the Ludwig mine, the purchase price of which was $500,000. The remaining $150,000 will not be required until the mine begins smelter shipments.

Mason, September 9.

NYE COUNTY

(Special Correspondence).—The August reports of the Tonopah mines show the camp to be in a flourishing condition. The Tonopah Mining and Montana Tonopah have maintained their usual net earnings, the Belmont has probably exceeded its surprising past monthly net earnings of $150,000, the Tonopah Extension reports a net earning of $25,000, the best month since the mill has been in operation, and the West End, which has the additional expense of shipping their ores to California smelters for treatment, reports a net earning of over $10,000. At a recent meeting the directors of the Tonopah Belmont voted a 15c. dividend, and in addition decided to construct a 40-stamp mill near their new shaft, as the present 60-stamp mill at Millers cannot handle the output. It is not considered advisable to enlarge the present mill with its disadvantageous site. The Belmont shaft, started nearly ten years ago and abandoned as a working shaft in favor of the Desert Queen, has now been enlarged to the surface as a three-compartment shaft. The work of riveting the 80-ft. steel head-frame has been completed, and the sheaves hoisted to position. The compressor has been assembled, and the hoist and compressor foundations await the delayed motors. The new ore-house and office buildings are nearing completion. Another month should find all in operation, which, besides giving ample working facilities and better ventilation, will mean a direct saving in cutting the tramming distance of ore and waste 800 to 2000 ft. Except the east drift on the 1100-ft. level in which the fault has been found to be of greater extent than at first anticipated, all the development drifts on the Belmont have added to the ore tonnage in sight.

Tonopah, September 10.

WHITE PINE COUNTY

The south cross-cut from the Eureka shaft on the 465-ft. level of the Ely Central mine has opened a number of stringers of porphyry in the limestone which show a good copper content. These are thought to be stringers of the main body of porphyry ore.

WASHINGTON

STEVENS COUNTY

H. E. Schleiff, of Berlin, who has just completed a thorough investigation of the deposits and development in the three camps in this county, situated from 40 to 75 miles north of Spokane, declares that within its confines is the largest and most promising tungsten field in the world. He said:. "The tungsten district in Stevens county has a chance to overshadow Boulder county, Colorado, in the next few years. Boulder county is the country's chief producer, having an output of from 3000 to 4000 tons of concentrate per year. Three camps are under development. One is the Germania in Cedar canyon, thirty miles north of Springdale; the Tungsten King, eight miles north of Deer Park; and the Blue Grouse, a mile south of the Tungsten King and eight miles from Loon lake.

CANADA

BRITISH COLUMBIA

(Special Correspondence.) The Consolidated Mining & Smelting Co. is about to begin mining operations at the Molly Gibson mine, Kootenay, and has shipped a carload of haulage machinery to that property from its Ross-land machine shops. The company has turned the old stamp plant at the St. Eugene mine into an experimental mill for the handling of the ores from its various mines. The plant has a capacity of 50 tons per day and will be used to ascertain the different methods of treatment that will be necessary to reduce the more complex ores of the company's mines. A strong party of capitalists on the Coast has bonded most of the mineralized ground on Toad mountain near Nelson and will, after a careful examination, commence active work in the spring. The property acquired includes the assets of the Hall Mining & Smelting Co., the Silver King mine, the Nelson smelter, machinery and tools, also the ground of the Dandy and Ollie mines, Starlight mines, and the Kelly, Rand, Buchanan, and Lennie mineral claims, the whole comprising 10 mineral claims or nearly 1500 acres of mineralized ground. A. G. French, consulting metallurgical chemist, who has had a lengthy experience in the treatment of lead-zinc ores at Swansea, Wales, is in this district studying the situation with a view to aiding in the solution of the local zinc smelting problem. The Maestro mine, near Ainsworth, which was shut down upon the death of the owner a couple of months ago, has been opened again, with Alex Green in charge. An effort is being made by the coal miners of southern Alberta and the Crows Nest district to obtain reciprocity in the matter of coal entering the United States from those points. It seems that the mines have reached the capacity of the market in domestic coal, while the supply is practically unlimited. The best domestic coal brings $3.85 per ton in Alberta, while the price in Winnipeg and Montana is about $8, because of high freight rates and duty. The chief obstacle is believed to be Nova Scotia, which demands protection from the coals of Pennsylvania and Virginia.——The syndicate which last fall bonded the Ikeda Bay mines has been reorganized as a stock enterprise, the authorized capital being $850,000 in shares of $1. The second payment on the bond has just been made, amounting to $30,000. The Japanese owners have agreed to take stock in the new concern for the balance of the purchase price, excepting a payment of $12,000 due in March. Andrew G. Larson, consulting engineer, of Vancouver, will have charge of the development of the two new veins found in his development by diamond-drilling. The power plant will be enlarged and a 2000-ft. tramway built from the adit. The 6500 tons shipped from this property by the late Japanese owners assayed from 4 to 5% copper and about $3 gold. The ore is self fluxing and can be mined and smelted economically. Freight rates to Ladysmith smelter will average about $3.50 per ton, and a treatment rate of $2 can be obtained.

Rossland, September 10.

MEXICO

SONORA

The Cia. Metalúrgica y Refinadore del Pacifico, S. A., has purchased the lead smelter at Guaymas. A number of changes will be made at the plant to put it in first-class condition and bring it up to date.——The first unit of the concentrating mill, having a capacity of 60 tons per day, has been successfully installed at the Santo Domingo mine in the Alamos district and is running full blast. The superintendent of this mine, James R. Hendra, reports that an excellent grade of lead-silver-copper concentrate is being produced. This mine, controlled by the Sonora Central Mines So., has been systematically developed over a period of three years, and has in the neighborhood of 3000 ft. of work, most of which is in ore. It is proposed to enlarge this concentrating plant to a capacity of 150 tons per day. The company has a working force of over 100 men. It is estimated that the earnings of the mill will be in the neighborhood of $15,000 per month.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS

TITLE TO MINING CLAIM—EFFECT OF SALE OF INTEREST DURING PATENTING

Patents from the Government to mining claims are frequently obtained in the names of the original locators without regard to intervening changes of ownership, and the fact that a corporation grantee of certain owners proceeded upon an application made by prior owners and obtained a patent to themselves did not estop such corporation grantee from asserting that the interest of one of such patentee had been forfeited pursuant to the statute and vested in the other grantors prior to the patent.

Van Sicer v. Ibex Mining Co., 173 Fed. 895, Oct. '09.

VALIDITY OF STATUTE FORFEITING INTEREST FOR FAILURE TO WORK

The United States Statute providing for the extinguishment of the interest of a part owner of a mining claim for failure to contribute to the assessment work required by such statute, is constitutional and valid, and a forfeiture under this statute will be enforced by a court of equity when such relief accords more with the principle of right and justice than would the denial of the relief prayed for. The other beneficial owners are the proper parties to give the notice to such part owner under the statute to forfeit his interest for a failure to contribute to the assessment work.

Van Sicer v. Ibex Mining Co., 173 Fed. 895, Oct. '09.

MINING LOCATIONS—"GRUB STAKE" CONTRACT

Under a "grub stake" contract a third person agreed to furnish the locator of a mining claim with supplies and in consideration thereof was to have an interest in the claim. In a controversy as to the rights of the parties it was held that the contract was not impaired by the fact that after obtaining certain goods and supplies on the credit of such third person the locator paid for such supplies himself. If, as a matter of fact, the "grub stake" contract did exist between the parties at the date of certain locations, and pursuant thereto such third person did furnish, according to the contract, necessary supplies to the locator, the right of the former to an interest in the property located during the life of the contract attached, although the locator did not locate any of the claims in the name of himself and such third person as equal owners according to the agreement.

Byrne v. Knight, (Cal.) 106 Pac. 593.

INJURY TO MINER—DUTY OF MINE OWNER

The rule of law that a master shall furnish a safe place for his servants to work, was applied where the lighting of a passage way in mine was necessary for the safety of the miners to enable them to do their work and to get to and from their work safely, and the failure of the mine owner to maintain the light because of the negligence of a servant did not relieve such mine owner from liability for injury to a miner. In such case the mine owner was held liable for the negligence of the person he employed to maintain the light, and a miner who had no actual knowledge of the danger in such pathway did not assume the risk, unless such danger was obvious to the person of ordinary prudence in the same situation, and such that it would not escape ordinary careful observation. The rule is also that the mine owner must furnish a suitable place where the miner with due care may perform his work without being exposed to any but the ordinary dangers of the occupation, and he is not required to familiarize himself with all the machinery or appliances which he himself does not use, and he may presume that his safety has been reasonably provided for. But whether the miner, injured by falling into a hole in the unlighted pathway in the mine, was guilty of contributory negligence, was held to be a question of fact to be determined by the jury.

Kaukola v. Oliver Iron Mining Co., (Mich.) 124 Northwest. 591, Feb. '10.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

CHARLES JANIN has gone to Mexico.

MARK R. LAMB is in New York City.

R. S. RAINSFORD was in San Francisco.

W. M. KNOX is at Diamantina, Brazil.

R. D. SALISBURY has been in San Francisco.

T. H. OXNAM has gone to Grants Pass, Oregon.

R. B. MARSHALL was in San Francisco this week.

H. F. LEFEVRE will be in Guatemala for two months.

R. H. CAMPBELL has again taken up his residence in San Francisco.

CARL F. DIETZ, of Dietz & Keedy, has returned to Boston from Europe.

W. S. LARSSEN, of Helena, Montana, is examining mines near Boise, Idaho.

R. VAN A. MILLS has gone to Tientsin, China, where he will be at the Imperial University.

M. A. NEWMAN, manager for the Cia. Minera Jesus Maria y Anexas, is in San Francisco.

ERNST WIENER has returned to New York from Europe, where he has been several months.

STANLEY C. HAROLD is assayer and surveyor for the MacNamara Mining Co. at Tonopah, Nevada.

FOREST B. CALDWELL is engineer in charge of the Candelaria Syndicate, at San Dimas, Durango, Mexico.

FRANCIS A. THOMSON recently made several examinations in Sanders and Missoula counties, Montana.

E. H. WEBSTER has resigned the management of the La República mine, Ocampo, Chihuahua, Mexico.

ROSS B. HOFFMANN returned from Colorado and has gone to make as examination in Tuolumne county, California.

E. K. SOPER has returned to Minneapolis after spending the summer in the iron and copper ranges of the Lake Superior district.

PHILIP WISE, of Los Angeles, who has been spending the summer in Europe, returned to New York on the 16th on the *Mauretania*.

MARSHALL D. DRAPER and JOHN GROSS have formed the firm of Draper & Gross at 746 Equitable building, Denver, and will do a general mining and metallurgical engineering business.

HOWARD THROCKMORTON has opened offices at Bakersfield, California, and at Mills building, San Francisco, for examinations, reports, and surveys, and supervision and management of oil properties.

FREDERICK A. HOFFMAN, general manager for the Hydraulic Supply Mfg. Co., died this week at Seattle after a brief illness. He founded the Pacific States Pipe Works in San Francisco and four years ago moved to Seattle, where he organized the Hydraulic Supply Manufacturing Company.

COPPER PRODUCERS' FIGURES, AUGUST

For the first time since April the figures of the Copper Producers' Association showed a decrease in the copper surplus, the amount on hand being 1,759,433 lb. less than the July stock. Copper stocks on hand September 1 were 168,881,244 lb. compared with 170,640,678 August 1. The production in August was 127,803,618 lb. as against 118,370,003 in July, an increase of 9,433,615 lb. Total deliveries in August amounted to 129,563,051 lb. compared with 116,115,342 in July, an increase of 13,447,709 lb. Of the deliveries 67,731,271 lb. were for domestic consumption and 61,831,780 for export, domestic deliveries increasing 11,023,096 and export 2,242,613 lb. over the July statistics.

Market Reports

LOCAL METAL PRICES.

San Francisco, September 15.

Antimony	12—12¾c	Quicksilver (flask)	46
Electrolytic Copper	14½—15¾c	Spelter	7—7¼c
Pig Lead	4.70—5.65c	Tin	37½—38c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Sept. 8	12 45	4.40	5.31	52⅞
" 9	12.45	4.40	5.33	53⅛
" 10	12.42	4.40	5 35	53
" 11	Sunday.	No market.		
" 12	12.40	4.40	5.39	53⅞
" 13	12.40	4.40	5.40	.3
" 14	12.40	4.40	5.44	53½

ANGLO-AMERICAN SHARES.

Cabled from London.

	Sept 8. £ s. d.	Sept. 15. £ s. d.
Camp Bird	1 11 9	1 12 0
El Oro	1 6 9	1 6 9
Esperanza	2 13 3	2 14 4½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 3	0 6 6
Mexico Mines	9 5 0	9 1 3
Tomboy	0 15 9	0 16 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Sept 15.		Closing prices, Sept. 15.
Adventure	5	Mohawk	47
Allouez	40½	North Butte	27½
Atlantic	6¼	Old Dominion	35
Calumet & Arizona	58	Osceola	124
Calumet & Hecla	643	Parrot	13
Centennial	16	Santa Fe	1⅛
Copper Range	66	Shannon	9¼
Daly West	5¾	Superior & Pittsburg	11
Franklin	10⅛	Tamarack	57
Granby	32	Trinity	5½
Greene-Cananea, ctf	6⅝	Utah Con	23
Isle-Royale	20¼	Victoria	2⅛
La Salle	10	Winona	7½
Mass Copper	7⅛	Wolverine	122

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Sept. 15.		Closing prices, Sept. 15.
Amalgamated Copper	63⅝	Miami Copper	18⅝
A. S. & R. Co	66¾	Mines Co. of America	9/16
Braden Copper	3⅜	Montgomery-Shoshone	⅛
B. C. Copper Co	5⅞	Nevada Con	20½
Butte Coalition	18⅜	Nevada Utah	⅜
Chino	16⅛	Nipissing	10⅞
Davis Daly	1⅛	Ohio Copper	1⅝
Dolores	5⅝	Ray Central	2¼
El Rayo	3¾	Ray Con	18
Ely Central	¾	South Utah	2
First National	3⅞	Superior & Pittsburg	11¼
Giroux	7	Tenn. Copper	27¼
Guanajuato Con	1	Trinity	6¼
Inspiration	8	Tuolumne Copper	2¼
Kerr Lake	6⅛	United Copper	4¼
La Rose	3⅞	Utah Copper	46⅝
Mason Valley	8⅝	Yukon Gold	3⅜

SOUTHERN NEVADA STOCKS.

San Francisco, September 15.

Atlanta	$ 12	Mayflower	$ 3
Belmont	4.10	Midway	23
Booth	10	Montana Tonopah	90
Columbia Mtn	5	Nevada Hills	2.25
Combination Fraction	41	Pittsburg Silver Peak	47
Daisy	4	Rawhide Coalition	12
Fairview Eagle	35	Rawhide Queen	25
Florence	2.30	Round Mountain	47
Goldfield Con	8.25	Sandstorm	5
Gold Kewenas	9	Silver Pick	8
Great Bend	1	St Ives	20
Jim Butler	29	Tonopah Extension	95
Jumbo Extension	45	Tonopah of Nevada	8 50
MacNamara	23	West End	60

(By courtesy of San Francisco Stock Exchange.)

Recent Publications

Report of the Surface Advancement Board for 1909. Pp. 39, III. Government Printer, Melbourne, 1910.

Dredging and Sluicing in Victoria, Australia in 1909. By D. B. Sellars. Pp. 14. Government Printer, Melbourne, 1910.

Production of Glass Sand, Other Sand and Gravel in 1909. By E. F. Burchard. U. S. Geol. Surv., Adv. Chapter Min. Res. 1909. Pp. 25. Washington, 1910.

Iron Ore Deposits of the Bristol Mine, Pontiac County, Quebec. By E. Lindeman. Bull. 2, Department of Mines, Canada. Pp. 15, III, maps. Ottawa, Canada, 1910. A description of the iron mines on the Ottawa river near Chatts Falls.

Geology of the Waitakere Subdivision, Raukumara Division, Poverty Bay. By J. H. Adams. New Zealand Geol. Surv. Bull. 9, N. S. Pp. 6, III, index map. Wellington, 1910. This is a detailed study of the geology of one of New Zealand's petroleum districts.

Production of Mineral Paints in 1909. By E. F. Burchard. U. S. Geol. Surv., Adv. Chapter Min. Res. 1909. Pp. 22. Washington, 1910. The value of the total production for the year amounted to $613,133, of which amount metallic paint furnished $256,373; ocher, $137,880; mortar colors, $116,126; shale and slate, $58,882; and umber and sienna, $43,872.

Preliminary Report on the Geology of the Monarch Mining District, Chaffee County, Colorado. By R. D. Crawford. Colorado State Geol. Surv. Bull. 1. Pp. 111, III., index, maps. Denver, 1910. This is an excellent account of the geology of a district not previously studied in such detail and marks a good beginning for the series of bulletins of this survey.

Coal Briquetting in 1909. By E. W. Parker. U. S. Geol. Surv., Adv. Chapter Min. Res. 1909. Pp. 71. Washington, 1910. Mr. Parker's annual review shows that substantial progress is being made. While the total output of briquettes is still small, 139,661 tons, plants are being operated at a number of widely scattered points and valuable experience is being accumulated at the same time that the public is being educated to the advantages of briquetted fuel.

Mining and Quarry Industry of the United States, 1909. By D. H. Newland. New York State Museum, Bull. 142. Pp. 96. Albany, 1910. The value of the mineral production of the State in 1909 amounted to $34,914,031, a gain of more than $5,000,000 over that for 1908. While New York is not the centre of any of the major mining industries, the total value of its mine product is large and the variety of minerals won is especially striking. The industry is evidently in healthy condition.

Summary Report, Miner's Branch, 1909. Canada, Dept. Mines, Pub. 63. Pp. 181. Ottawa, 1910. In addition to a general summary report by the director, Eugene Haanel, this volume includes a preliminary report on the mineral production of Canada, by John McLeish; a study of commercial methods of analysis of oil shales, by H. Leverin; a reprint of the report made by Messrs. Carl Meissner, Victor Watteyne, and Arthur Desborough, to the U. S. Geological Survey on prevention of mine accidents; and a paper on the examination of magnetic ore deposits, by Howells Fréchette. Canadian mineral production now amounts to $73,917,146 per year, of which $41,774,362 comes from the metal mines. It is evident that intelligent preparation is being made for the much larger production that Canada is sure to have.

Cement Industry in the United States in 1909. By E. F. Burchard. U. S. Geol. Surv., Adv. Chapter Min. Res. 1909. Pp. 22. Washington, 1910. The total quantity of portland, natural, and puzzolan cements produced in the United States during 1909 was 64,196,386 bbl., valued at $51,232,979. As compared with 1908, when the production [illegible] at 44,[illegible] showed an increase of 21.6 per cent in quantity and 28.7 in value. The largest increase was in the manufacture of portland cement, but in which the average price was [illegible] per barrel. This was 5 to 9% higher than the average in the United States and about 10% higher than the average for the Central States. While production in the East continues to increase, the coal marks another stage in the decline of the relative importance of the Lehigh district.

MINING CONGRESS PROGRAM

The detailed program of the meeting of the American Mining Congress at Los Angeles September 25 to October 1 is not yet available, but the attractive circular now being distributed assures that a week of pleasure as well as important business sessions awaits the delegates. Convening Monday morning, September 26, at 10 o'clock, the day will be devoted to the formal welcomes and the shaping of the week's work. The evening will be devoted to a reception to the delegates and visitors by the Chamber of Commerce. Tuesday evening there will be a President's Reception at the Alexandria Hotel, the official headquarters. Wednesday afternoon the ladies of the Sierra Madre Club will entertain the visiting ladies at tea at the Alexandria Hotel, while the same evening, or the one following, the members of the Sierra Madre Club will give a stag reception in honor of the visiting delegates. Saturday morning's session, the last one of the Convention, will recess at 11 o'clock, the members, delegates, and visitors with their families to reassemble at 12:30 o'clock, after luncheon, to entrain for Long Beach for an afternoon together. The special trains will be held for a dance during the evening at the Virginia Hotel. Sunday all who care to will go in a party to Avalon, on Catalina Island, undoubtedly the most picturesque and interesting island port on the entire Pacific Coast, if, indeed, as many foreign travelers have claimed, not in the world. The Los Angeles Chamber of Mines will co-operate in the entertainment of guests, and extends an invitation to all visitors and delegates to inspect its mineral exhibit at its headquarters, which will be open to all.

At the Los Angeles session the report of the committee upon prevention of mine accidents, and the reduction of State mining laws to uniformity, will be given. This committee was appointed at the session of the Mining Congress held in Denver in November 1906. At each succeeding session it has reported progress, and at this year's meeting its final report will be given. The following is the membership of the committee: Walter Renton Ingalls, chairman, James Douglas, J. Parke Channing, James R. Finlay, John Hays Hammond. The report is endorsed by all of the committee. It also has been submitted to many mining engineers and mine operators for suggestions.

COMMERCIAL PARAGRAPHS

The Rix Compressed Air & Drill Co., San Francisco, has recently issued Bulletin No. 144, describing its prospectors' outfits for machine drilling. Numerous combinations of small compressors, gasoline engines, motors, drills, etc., are shown in detail. The outfits are particularly advantageous to those who desire to do prospecting or assessment work more rapidly and more cheaply than is possible by hand drilling. They should also appeal to small companies desiring to change from hand to machine drilling with the smallest initial expenditure.

The Terry Core Drill Co., 50 Church St., New York, reports a very successful record of drilling from the Plainfield Mining Co. A Class A Terry Drill was used, it being a mounted rig. Although extra expense was incurred owing to having to haul fuel and water to the drill, the cost was considerably below the estimates or expectations, it being less than $1 per foot. Two men operated the drill, working 9 hours per day. Thirteen days' work resulted in a total drilling of 235 ft. through slate and pyrite, and a 2⅞-in core was removed.

OIL DIVIDENDS FOR AUGUST, 1910.

From the Official Monthly Statement of Oil Securities of the San Francisco Stock Exchange.

Company.	Capital.	Shares issued.	Par value.	Acreage.	Location.	Dividend. Last date.	Amount per share.	Total to date.
Alma Oil Co.	$400,000	380,000	$1.00	120	Kern River	7 15 '10	$ 3	$182,400.00
Amalgamated Oil Co.	5,000,000	50,000	100.00	*	Salt Lake Field, L. A.	7 15 '10	1.00	1,500,000.00
Amer. Petroleum (pfd.).	2,500,000	25,000	1.00	*	Coalinga and Sherman	8 1 '10	66	261,975.20
Apollo	500,000	200,000	2.50	40	Kern River	3 20 '10	1	4,000.00
Associated Oil Stock.	40,000,000	400,000	100.00	*	Kern, Coalinga, McKittrick.	3 1 '07	1.50	1,548,368.54
Associated Oil Bonds 5s.	3,006,000	.....	....	*	Kern, Coalinga, McKittrick.	.....	....	.....
Bay City	500,000	100,000	5.00	200	Midway	8 15 '10	10	145,000.00
Blue Moon	200,000	189,759	1.00	20	Coalinga	.....	....	.....
Brookshire	500,000	500,000	1.00	933	Santa Maria and Midway.	1 1 '10	1	442,500.00
California Midway	1,000,000	922,800	1.00	160	Midway	.....	....	.....
California Oil & Gas.	1,000,000	900,000	1.00	[illegible]	Coalinga	.....	....	.....
Caribou Oil & Mining Co.	100,000	80,703	1.00	100	Coalinga	8 15 '10	25	801,410.19
Chicago Crude	1,000,000	1,000,000	1.00	100	Kern	3 25 '07	0½	15,000.00
Claremont	500,000	500,000	1.00	280	Kern and Coalinga	8 28 '10	2	375,000.00
Coalinga Central	500,000	450,000	1.00	120	Coalinga	.....	....	.....
Coalinga Pacific	165,000	65,000	1.00	40	Coalinga	12 23 '09	10	107,250.00
Columbia	1,000,000	999,226	1.00	*	Fullerton and Whittier.	8 25 '10	½-½	324,759.97
Cresceus	320,000	320,000	1.00	40	Midway	.....	....	.....
Dabney	1,000,000	1,000,000	1.00	120	Midway	.....	....	.....
Del Rey	1,000,000	785,190	1.00	40	Kern River	7 1 '10	0½	15,710.00
De Luxe	100,000	100,000	1.00	40	Coalinga	.....	....	.....
Eldorado	100,000	100,000	1.00	10	Kern River	8 31 '10	1	.....
Empire	200,000	200,000	1.00	80	Coalinga	7 31 '10	3	6,000.00
Enos	500,000	358,500	1.00	220	Kern and Santa Barbara.	.....	....	.....
Esperanze	160,000	160,000	1.00	170	Coalinga	12 27 '09	9	49,450.00
Euclid	350,000	350,000	1.00	10	Kern and Coalinga	8 1 '10	1	141,500.00
Four Oil	300,000	300,000	1.00	20	Kern and Coalinga	2 25 '10	1	213,000.00
Fulton	1,000,000	100,000	10.00	120	Sunset	.....	....	.....
Globe	600,000	600,000	1.00	20	Kern River	4 1 '10	1	87,000.00
Graciosa	1,000,000	1,000,000	1.00	*	Santa Maria	.....	....	.....
Home	100,000	100,000	1.00	140	Coalinga	8 20 '10	2	484,000.00
Homestake	100,000	10,000	10.00	160	Coalinga	7 15 '10	10	79,250.00
Illinois Crude	200,000	200,000	1.00	10	Kern River	6 1 '10	1	94,000.00
Imperial	500,000	100,000	5.00	2,480	Kern and Coalinga	7 18 '10	8.00	4,000,000.00
Junction	250,000	250,000	1.00	[illegible]	Kern River	6 1 '09	1	20,000.00
Kern River	100,000	20,000	5.00	[illegible]	Kern River	8 1 '10	10	110,000.00
Linda Vista	.....	385,850	....	20	Kern River	8 5 '10	1	80,608.50
Lucile	50,000	26,704	1.00	40	Coalinga	12 20 '09	10	42,727.04
Mascot	500,000	500,000	1.00	225	Midway	8 20 '10	2	40,000.00
McKittrick	500,000	500,000	1.00	1,200	McKittrick	.....	....	.....
Mecca	500,000	422,500	1.00	120	Kern River	7 15 '09	3	71,825.00
Midway of Oregon.	1,000,000	1,000,000	1.00	640	Midway	.....	....	.....
Monte Cristo	500,000	500,000	1.00	80	Kern and Sunset	8 25 '10	10	640,000.00
Mountain Girl	350,000	350,000	1.00	*	Midway	8 4 '10	2	7,000.00
Mexican Petroleum	50,000,000	10,000,000	5.00	*	Mexico	8 1 '10	1½	3,111,807.93
M. & M.	1,000,000	1,000,000	1.00	140	Maricopa	.....	....	.....
Nevada County	250,000	250,000	1.00	30	Kern River	10 13 '08	4	40,000.00
New Penn. Petroleum.	500,000	500,000	1.00	147	Santa Maria	8 15 '10	1	15,000.00
Palmer	2,000,000	1,802,010	1.00	880	Santa Maria	8 25 '10	1	340,451.15
Paraffine	300,000	300,000	1.00	40	Midway	8 15 '10	1	30,000.00
Peerless	1,000,000	100,000	10.00	160	Kern River	9 20 '09	6	801,000.00
Piedmont	500,000	389,000	1.00	10	Kern River	5 9 '10	1	26,877.30
Pinal	200,000	150,000	1.00	*	Santa Maria	8 31 '10	10	961,921.50
Premier	1,000,000	1,000,000	1.00	160	Coalinga	7 20 '10	1	40,000.00
Producers	500,000	80,000	5.00	600	Midway	5 1 '10	1.00	80,000.00
Radium	250,000	250,000	1.00	*	Santa Maria	.....	....	.....
Record	200,000	100,000	2.00	40	Coalinga	8 15 '10	7½	92,500.00
Republic	600,000	500,000	1.00	[illegible]	Coalinga	.....	....	.....
Rice Ranch	300,000	300,000	1.00	40	Santa Maria	6 10 '10	1	108,000.00
Rico	100,000	100,000	1.00	[illegible]	Midway	.....	....	.....
Royalty	20,000	20,000	1.00	20	McKittrick	6 13 '10	1½	22,733.33
S. F. & McKittrick.	500,000	50,000	10.00	151	McKittrick	8 1 '10	30	415,000.00
Sauer Dough	100,000	199,500	0.50	270	Coalinga and McKittrick.	8 21 '10	5	547,228.50
Section 7	400,000	400,000	1.00	[illegible]	Coalinga	.....	....	.....
Section 25	40,000	40,000	1.00	290	Midway	8 26 '10	25	60,000.00
Sesnon	100,000	100,000	1.00	35	Kern River	8 8 '10	7	139,000.00
Shawmut	500,000	500,000	1.00	*	Coalinga	.....	....	.....
Silver Tip	75,000	75,000	1.00	20	Coalinga	2 25 '10	10	30,000.00
Sovereign	500,000	500,000	1.00	20	Kern River	4 15 '10	1	95,000.00
S. W. & B.	400,000	377,000	1.00	40	Coalinga	9 10 '09	1	41,470.00
State	100,000	100,000	1.00	20	McKittrick	.....	....	.....
Sterling	250,000	250,000	1.00	160	McKittrick and Kern	3 15 '10	12½	778,250.00
Sunset Monarch	500,000	497,211	1.00	*	Sunset and Midway	.....	....	.....
Superior	500,000	500,000	1.00	40	Sunset	7 26 '10	1	62,500.00
Thirty-Three	500,000	100,000	5.00	160	Kern River	8 6 '10	1.00	1,090,000.00
Traders	1,500,000	15,000	100.00	410	Kern, Coalinga and Midway	5 15 '10	1.00	209,146.50
Turner	500,000	500,000	1.00	320	Coalinga	.....	....	.....
United	.....	80,751	....	*	Controls Union	8 20 '10	50	2,380,837.43
Union	50,000,000	249,626	100.00	*	All Fields of State	8 20 '10	50	6,992,320.15
Wabash	500,000	300,000	1.00	80	Coalinga	7 19 '10	20	189,000.00
West Coast (com.)	2,500,000	10,408	100.00	*	Los Angeles	.....	....	.....
West Coast (pfd.)	2,500,000	10,408	100.00	*	Los Angeles	6 15 '10	2.00	104,080.00
West Shore	100,000	100,000	1.00	80	Kern River	12 21 '08	5	235,000.00
Wolverine	100,000	100,000	1.00	60	Kern River	.....	....	.....
W. K. Oil	500,000	500,000	1.00	320	Coalinga	.....	....	.....
Western Union	1,000,000	10,000	100.00	10,000	Santa Maria	4 15 '07	2.00	484,951.00
Hanford	.....	1,000,000	....	....	.....	1 30 '06	22	80,000.00
Kern Oil	.....	.....	.....	.....	.....	11 19 '09	24½	42,000.00
Pittsburg	.....	.....	.....	.....	.....	11 11 '07	43½	124,800.00
Reed Crude	.....	.....	.....	.....	.....	5 31 '10	....	1,167,500.00

Total dividends for August 1910, $1,069,917.56; total to date, $34,682,082.50. *Information unobtainable.

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EDITORIAL

DEATH annually claims victims on the deserts of the world and every effort should be made to mark the trails to the water holes. The U. S. Geological Survey has issued a general map of the Nevada-California desert, but additional surveys and permanent sign posts are needed. It is proposed to ask the Federal Government to undertake this work, but marking trails seems rather to be a function of the States.

REGULATION of rates over the White Pass & Yukon railway has been undertaken by the Canadian authorities. There have been charges of rebates and secret rates. At a hearing in Seattle last year the Interstate Commerce Commission declined to interfere because its jurisdiction is restricted to the United States and its 'territories,' while Alaska is officially a 'district.' The distinction is worth remembering in connection with railway building in the Far North. It is evident that away from the border shippers could not count on the good offices of the Canadian commission.

LOS ANGELES will welcome the American Mining Congress on Monday next, and through the week the Sierra Madre Club, assisted by the Chamber of Mines, will officially entertain the mining men. Unofficially the citizens will extend many courtesies to their visitors such as always leave a pleasant train of recollections after days spent in southern California. Time was when Los Angeles was thought of as a place where expatriated but thrifty Hawkeyes diligently exploited a charming climate and a much-nurtured set of Spanish traditions, to the end that hard-baked, cactus-covered ground should be transmuted into 'real estate' and town lots sold for real money. Later, all the land within the encircling mountains having been platted, and fashions changing, mining stocks and oil 'securities' became the staple merchandise. Too long, however, has the public regarded these as the leading industries of the city. Los Angeles has passed from the realm of the potential into the actual. Blocks of fine office buildings, acres studded with beautiful homes, miles of well kept streets and roads, will be shown the visitors. Actual and substantial commerce has been developed and is growing. Far more significant, however, is the spirit of the place. It carries a lesson that we wish each visitor might take home with him. Here is a beautiful and growing city, one that has every feature of the active development that is so dear to Western Americans, a city that has developed pre-eminently the much vaunted 'get together' attitude of public mind, and yet it is one which the people actually rule. Primary elections, the initiative

and referendum, the recall—all these may be seen in familiar operation. It is a place where the citizens take active and intelligent interest in municipal affairs and interpret broadly the functions of government. The great aqueduct, bringing water 250 miles, is being built by the City, largely on force account, and the work is being done as efficiently and as cleanly as any ever undertaken by an American municipality or private corporation. Los Angeles values efficient service in engineering and in business, and secures for itself as good men as serve the railways, power companies, or other corporations. This spirit of the city, this proof that progress does not spell corruption, that unity does not mean domination by corporations, is the finest thing Los Angeles has to offer her guests.

EXAMINATIONS will be held October 15 by the United States Civil Service Commission for the position of 'foreman of mine rescue station,' to which place a number of appointments will be made this fall. In judging the applicants, physical ability will be rated at 40 points, and training and experience at 60. The practical character of the examination is indicated by the announcement that "applicants should have had experience as fire boss, mine foreman, or inspector in coal mining. They should be thoroughly experienced in underground work, capable of finding their way in the darkness of mines with which they have had no previous familiarity, and should have the courage, skill, and physical endurance required in directing rescue operations underground after mine explosions." The pay is set at $1080 to $1500 per annum. All this hardly tallies with the fears of those who thought the purpose of creating the Bureau was 'to provide easy political jobs for highly estimable gentlemen.'

Field of the Mining Congress

The thirteenth session of the American Mining Congress, about to assemble at Los Angeles, is like to mark a turning point in the history of that organization. To many it seems that the chief object of the Congress has been accomplished and that it would be better to adjourn *sine die* than to linger on to a neglected old age. No one can gainsay that forcing the establishment of the United States Bureau of Mines was a substantial achievement on the part of the American Mining Congress. Originally the demand was for the creation of a Federal Department of Mines with a cabinet officer at its head. It was felt that nothing short of that would correspond properly with the importance of the mining industry, and that no less influential an official would be able to obtain for mining and metallurgy the recognition and assistance necessary to their proper growth. The time, however, for the creation of such a Department, if it ever existed, passed. The multiplication of Departments brought confusion rather than order in Government affairs, and the increased power and dignity accruing to the great Bureaus, whose heads remain through administration after administration instead of passing on with each change in the balance of political power, lead to revision of program. A Federal Bureau was asked instead of a Department, and at last the Bureau has been created, a satisfactory Director appointed, and adequate funds for beginning the work have been appropriated. There are those who hold that the purpose of the Congress has been accomplished and that further maintenance of the organization would be futile, answering artificial rather than real needs.

Creation of the United States Mining Bureau, however, was ever but one of the purposes of the Congress. The Bureau was demanded as a means to an end, rather than as the end itself. The real object is the benefiting of the mining industries. To this end the Congress endeavors to promote discussion among mining men of all problems of a public character relative to the industry; to determine what shall be the attitude of the States and of the United States toward mining in all its branches; to crystallize opinion among mining men; and to formulate demands when demands are proper. Establishment of a Bureau at Washington is but an incident. The Bureau must be supported and must be kept up to its work. Criticism, both friendly and at times adverse, of it and of other Federal Bureaus, will doubtless be needed. It is well to remember that ours is a government by public opinion, and since official government, both of the States and the Nation, touches mining at many points, it is important that no agency for creating sound public opinion be neglected. Mining, however, is diverse. Between stoping lead ore and petroleum production, between smelting gold and mining coal, there seems at first to be but little common ground. All, none the less, have relations to freight rates, and, in the Western States, all are vitally interested in questions relating to public lands. All mining and smelting industries have some relation to Government inspection and all have interest in seeing that it be conducted honestly and efficiently—with due regard to the safety of the men and yet not so as to unnecessarily restrict mining operations. These are but a few of the common points. A vigorous and sound public opinion may well be a prime agency in securing substantial justice coupled with that active development which betokens a sound condition of industry. In affording a forum for discussion, a meeting place where acquaintance takes off the edge from controversy, a vigilant and effective means of publicity, the Mining Congress may well serve a useful purpose indefinitely. If though, it retain the fealty of men of such varied interests it must necessarily adopt a broadly tolerant attitude. Its work must be largely educational, and its resolutions must depend for their force on the intelligent conviction back of them, rather than on artificially obtained majorities. Indeed the resolution should be but the minor element. The discussion that leads to agreement is all important. Concerning many of the questions that will be up this year it may well prove impossible to come to any but a forced agreement and the Congress will do better to thresh out these matters in discussion, to make possible the delimitation of the field within which there is substantial agreement as contrasted with matter concerning which there is as

yet no consensus of opinion than to force a seeming but false unanimity. It is better to go but a short distance than to travel the wrong road. If the Congress do the things here outlined it will find ample field for its exercises and the meeting of this year will mark a step toward larger usefulness rather than an abandonment of its field.

Conservation and Mineral Lands

New times bring new issues and new duties. The American Mining Congress meeting at Los Angeles next week will be called upon to discuss and to help solve a whole range of problems that have suddenly become vital. Conservation of natural resources is old, but many of the problems connected with it are new to the Nation and to many of the people most directly concerned. No phases of the matter are more complex than are those relating to minerals and mineral land. The water in the streams will continue to flow, lands once cut over may be reforested, and within limits worn out soils may be restored to fertility, but coal once burned can not be recovered, oil drawn from the earth is not to be drawn again, and ore that has been mined and smelted can no more be counted in ore reserves. If any have a vital interest in conservation it is the miner and, appropriately, the problems of conservation will occupy large place on the program at Los Angeles.

The Conservation Congress that met September 5 to 9 at St. Paul, was a most important gathering. It included representative men from all parts of the country. The addresses were weighty and the debates informing. The enthusiastic call to arms by Mr. Roosevelt and the calm judicial treatment of the subject by Mr. Taft were notable features of the meeting. Fundamentally the same thing was said by both men. The difference in manner reflected little in point of view, and the Congress adopted practically the program they enumerated. Despite these excellent features there is a strong undercurrent of dissatisfaction with the result. It is true that effective conservation involves problems of political economy as well as of science and technology, and that changes in governmental procedure are made through political action. It is apparent that the 'Insurgents' captured the Conservation Congress and that if the program adopted at St. Paul be followed, conservation and 'Insurgency' will become almost synonymous. While appreciating fully the importance of aggressive political leadership in order to accomplish correct solution of certain conservation problems and while personally sympathizing fully with the 'Insurgent' movement, we would not have it forgotten that conservation is a need of all time. Wise use of our resources is as vital to one part of our people as another and a close political alliance has its perils as well as its merits. At St. Paul, mining and its problems were all but unrepresented. Only one speaker, Mr. T. L. Lewis, president of the United Mine Workers of America, was advertised to speak on a distinctively mining topic and he was unable to be present. There is a widespread feeling that many of the peculiar problems of the West especially those relating to mineral lands were handled by the Congress. They may or may not have been well handled, the solution proposed a general leasing system may well be the wisest, but the fact remains that the action of the convention was not that of the people most directly concerned. At Los Angeles there will be opportunity for these people to be heard to criticise if they will and to justify their criticism if they can. For our own part, without wishing to be dogmatic we are prepared to endorse some form of leasing as applied to coal, oil and phosphate lands and we believe that whatever may prove wise in the future, for the present the public lands in the West should remain under Federal control. In taking this ground we are not unaware of the difficulties in the way of a simple and effective leasing system, we fully recognize the advantages of stimulating individual initiative by giving every citizen a freehold, we believe use is as important as conservation, and we recognize the justice of the argument that the resources of the West should belong to the West, as well as the desirability of developing good State governments by placing responsibilities on the shoulders of the citizens of the States.

The vital problem of the present is to keep the way clear for the future. This is possible under a leasing system. If a mistake be made new leases can be granted on different terms as the old expire. If the whole system prove cumbersome and unwise, it can be swept away and leases converted into fees. The reverse is not true, and therein lies the sound reason back of present adoption of the leasing system. It would be idle to contend that a completely satisfactory form of lease may be devised at once, the system will not free us from difficulties, but it will save the future and will permit close approximation to the needs of the times as conditions change. As to the matter of State versus Federal control, there are sound arguments on both sides. Unquestionably many of the problems of conservation are local, but it is equally true that many are inter-state in character. With the present doubt as to division of authority it is not well to give up a possible vantage point until fully assured as to results. Regardless, however, of theoretical arguments as to proper future division of authority and responsibility, there is a practical point involved. The East and the Middle West are not favorable to any plan of turning over the public lands to the States. Politically they control the situation so that the matter is, for the present, removed from the realm of practical policy. The truth is, and it may as well be faced, that the political conscience of the Nation as a whole is more fully alive to the situation than is that of the people in the Western States. It is also true that it is less expensive to corrupt a State government than to dominate Congress or a Washington department and this is unfortunately important. National legislation and administration are watched more closely and by more people, and are cleaner than is government in at least some of the States. So long as this remain true sound public opinion will favor National rather than State control.

Judith Basin, Montana

STAFF CORRESPONDENCE

Judith Basin embraces that portion of Fergus county, Montana, which is drained by Judith river and its tributaries, comprising nearly one-half the area of the county. While the greater part of this is occupied by wheat growers and live stock men, it has a gold-mining industry, the proceeds of which place Fergus county in the lead among the counties of Montana as regards gold production. The principal supply of this metal comes from the mines which are situated in the North Moccasin and Judith mountains, these being detached ranges on the east side of the Judith river. Kendall is the principal mining town of the North Moccasin, and is twenty miles north of Lewistown. In this range are the Kendall, Barnes-King, and Santiago mines. Maiden and Gilt Edge are mining towns, six miles apart, in the Judith range, and are twenty and fifteen miles, respectively, northeasterly from Lewistown. Maiden is one of the oldest mining camps in the county and has such mines as the Cumberland, Spotted Horse, McGinnis, and New Year, while at Gilt Edge is the Gold Reef mine. The Chicago, Milwaukee & Puget Sound Railway Co. owns the railroad from Harlowton, on its main line, to Lewistown, a distance of sixty-five miles, and this branch is being extended northerly to the Missouri river, the route coming within four miles of Kendall. The Utica sapphire mines, noted for the high quality of their product, are situated in the southwestern part of the basin country. The earliest discovery of this region by white men was made by the Lewis & Clark expedition in 1805, when the name it now bears was given to Judith river.

Not much ore is shipped from the Judith basin, as it is generally highly silicious, free from refractory elements, and amenable to successful treatment by cyanidation. Plants of this character are at present in operation at the Kendall, Cumberland, and Gold Reef, and the practice consists of coarse-crushing and direct leaching in vats by the simplest methods, with no separation of sand from slime. The Cumberland mine is owned by James Breen, of Spokane, and his associates, who erected a mill of 100 tons capacity and set it in operation last May. The first ore milled consisted of 2100 tons of dump material that had accumulated; this ran $11.08 per ton. Since that was finished the mill has been operated on ore from the mine. During the first two weeks of August the mill heads showed $12 per ton, the tailing 66c.; the cost of milling was 65c. per ton; cyanide consumption ¼ lb. per ton; lime, 3 lb.; zinc, ½ lb. The aim is now to get mining and milling costs on the basis of $2.50 per ton; and on the results of thoroughly sampling the ore exposed in the mine, it is estimated that it will average not less than $8 per ton. The ore is reduced to ¼-in. size and is given a 5-days' treatment, the extraction being about 93%. It is being arranged to lengthen the period of leaching to six days, and possibly increase the percentage of extraction. The ore consists of oxidized porphyry and cherty limestone, carrying gold in very finely divided free particles, and in the form of rusty gold that may have resulted from the oxidation of a telluride. In the meantime additional rolls, elevators, and leaching vats are being installed to double the capacity of the mill; and a change from steam to electric power is being made, the plan being to purchase electric power from a local company. The cyanide work heretofore in charge of H. C. Coolidge, is now in control of J. H. McCormack. Mr. Coolidge has been transferred to Mr. Breen's property near Helena. As to the mine, it may be stated briefly that it is situated on the north end of a contact vein that occurs between limestone and porphyry. It was opened ten years ago by Peter Rosso and others, who operated with good success on the high-grade parts of the orebody. In 1909, prior to the sale of the property to Breen and associates, Rosso shipped five carloads of ore to the smelter that netted him $25,000. Most of this rich ore was taken from an intermediate level 80 ft. below the surface. The mine was first opened by a vertical shaft from the surface to a depth of 183 ft., from which three levels were driven; later, a 200-ft. adit was driven to the base of the shaft from the side of the hill. This is called the mill-level, as trackage from it leads to the feed floor of the mill. The workings show a body of oxidized ore over 100 ft. wide on each level. On No. 3 level is a stoped-out chamber 72 ft. long, 45 ft. wide, and 32 ft. high, and it does not appear that either wall was cut. On No. 2 level, 86 ft. above No. 3, there is a cross-cut about 100 ft. in ore. Work is in progress on the strike of the vein at the mill level and on the one above it. Albert I. Goodell, formerly superintendent of the Northport smelter, is at the Cumberland as the representative of Mr. Breen.

The old Spotted Horse mine, now under option to James Breen, is adjoining the Cumberland on the south, and is on the same contact. Since taking the option Mr. Breen has had the 440-ft. shaft retimbered, the levels cleaned out and put in order, and the ore exposed has been sampled. On the dump there are estimated to be 30,000 tons of ore which may average $7.50 per ton. It is possible that the ore on the dump and some of that in the mine may be treated at the Cumberland mill. The Spotted Horse ore, however, contains some base material, and its treatment would be more difficult than that of the Cumberland. It is claimed the Spotted Horse, operating from 1893 to 1902, produced ore of the value of $3,000,000, and that the recovery of the gold and silver was by pan-amalgamation. The milling plant was destroyed by fire eight years ago. The owning company, which gave the option, is the St. Paul & Montana Mining Company.

Still farther south on the contact is the McGinnis mine, owned by Conrad-Stanford Co., of Helena. In earlier days it was a good producer and supplied a mill. It is now being operated by lessees who employ a small force and make regular shipments of sorted ore to a smelter at Butte. The last car of ore shipped had a gross value of $70 per ton. The McGinnis ore contains a good deal of visible free

gold, associated with considerable sulphide material.

The Gold Reef mine and mill at Gilt Edge belong to John A. Drake, of New York, and are under lease to W. W. Badger, T. O. Caldwell, E. W. Cooper and R. F. Turner, who are now in the fourth year of the term of lease. Drake purchased the property from the Great Northern Development Co. in 1903, the milling having been built previous to this. The orebody here occurs in the form of a nearly flat vein between a porphyry hanging wall and a limestone

Kendall, Montana, in the Judith Basin.

Gold Reef Mine, Gilt Edge, Montana.

foot-wall. It is opened by one principal adit level that has been driven 2400 ft. partly in the foot-wall and partly in the orebody. Numerous raises are made from the adit level into the stoping ground. One stope above this level shows 300-ft. width of ore and a thickness of 98 ft. A large tonnage is mined from open-cuts above the main haulage level. The strike of the ore zone is north-south, and the workings extend a mile thereon. The main zone is divided into three separate sections by the erosion along two gulches. The gangue is made up of porphyry and altered limestone and will hardly average $2 per ton. Some months it has run as low as $1.60. The total mining and milling costs seldom run higher than $1.10 per ton of ore milled, the ore treated averaging 225 tons per day. The gold occurs in fine particles, but is non-amalgamable. The mill is equipped with a No. 5 Gates crusher, 2 sets of rolls, each 36 by 24 in., six leaching vats—four of 165 tons capacity and two of 240 tons. The ore comes to the vats crushed to ¼ in. and less, the leaching period being 72 hours. This is an example of economical operation on a narrow margin. The small profit each month could easily be wiped out by a little extravagance.

The Kendall mine belongs to the Kendall Gold Mining Co., of which H. H. Lang is superintendent. It is situated at Kendall at an elevation of 5000 ft. Electric power is used and this is generated on Warm Spring creek, five miles distant and 1200 ft. below the mine. The water all comes from a large warm spring 100 ft. in diameter, and flows at the rate of 8000 cu. ft. per minute. At present 400 hp. is used at the mine. Much of the mining to date has been done by open-cuts. In underground workings the timbering is with square-sets which are filled. There is about 8% moisture in the ore, just enough to keep it from being dusty. The ore is ideal to treat with cyanide, yielding 87% with low strength solution. It is crushed so as to pass through a screen having one-half inch square opening, is carried by belt conveyor to steel vats, and covered with strong solution (1½ lb. of 125% NaCy to one ton of water), for three days, followed by the weaker solution (1-lb. strength) for two days, and finally one day of washing with water. In treating 693.972 tons of ore averaging $5.75, the tailing assayed $0.734; an extraction of 87%. The costs for the above tonnage were as follows: development, $0.481; mining, $1.125; milling, $0.517; office, insurance, taxes, interest, exchange, and legal expense, $0.238; miscellaneous, $0.261; total operating expenses, $2.622.

BORAX IN CALIFORNIA

The production of borax in the United States is at present confined to two California mines, the Lila C of the Pacific Coast Borax Co., situated in the foothills of the Funeral range of mountains, and the Lang mine of the Sterling Borax Co., about fifty miles north of Los Angeles. The monthly production of these two mines is between 3000 and 3500 tons of crude mineral.

The Lang mine of the Sterling company is situated at Lang, Los Angeles county, and is connected with the main line of the Southern Pacific by a narrow-gauge railroad five miles in length. The mineral occurs in a vein from 6 to 16 ft. wide, between two porphyry dikes about 100 ft. apart. The dip of the vein is about 70°, and both hanging and foot-wall are composed of a slaty clay. Back of this clay is a hard sandstone that holds well enough to permit of mining from open stopes. The deposit has been developed on the surface for about 1½ miles and is opened underground by two shafts, between 250 and 300 ft. deep, and about one mile of workings. The mineral, which is chiefly colemanite, occurs in shoots about 1000 ft. long, and has the following approximate composition as it is mined: anhydrous boric acid (B_2O_3), 36%; lime, 35; silica, 10; magnesia, 1 to 5; balance, water. Among other borates, the mineral pandermite is found here. This is a white chalky material, high in boric acid, but so refractory that it cannot be handled profitably at the present price of the mineral. From 60 to 70 men are being employed at the Lang mine and about 1500 tons of mineral per month are being shipped to the Chicago and Pittsburg refineries of the Sterling company.

The Lila C mine of the Pacific Coast Borax Co. lies about eighteen miles northwest of Greenwater and eight miles southwest of Death Valley Junction, from which point it is connected by a spur with the Tonopah & Tidewater railroad. Here there is a deposit of calcium borate from 3 to 18 ft. thick and dipping about 45° easterly. The deposit has been opened by adit levels, surface development extending for over a mile. The production here is slightly larger than at Lang, but the grade of the mineral is not quite so high. Before shipment to Eastern refineries the material is calcined.

Although it is impossible to secure any definite data on costs, there can be no doubt but that both of these mines are operating at a loss. In general it may be said that in order to pay a reasonable interest on the investment the price of the finished product must be in the neighborhood of 5c. per lb. For the past two years the price has been below 4c. and for the last few months the quotations have been near 3½c. The low price of borax is the result of a fight for the control of the industry that has been in progress for more than two years. At present the Pacific Coast and Sterling companies are the only contestants and there is nothing in sight to indicate the end of the struggle. The owner of a small borax property has no possible chance, his only hope being to sell at a sacrifice to one of the above-named companies.

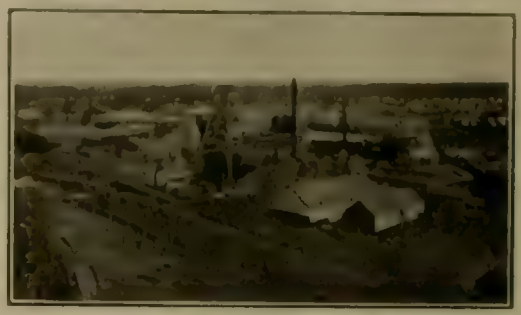
In addition to its use in medicine and for various household purposes, borax is employed in the manufacture of various grades of glass, porcelain-coated ironware, pigments, and preservatives for canned goods. To a certain extent borate of ammonia renders cotton goods uninflamable. Borate of chromium is used in a green pigment for printing on calico. Borax is used also in assaying and in soldering, brazing, and welding metals. This use is due to its property of dissolving metallic oxides when heated to a high temperature.

Metallurgical Practice in Western Australia

By A. E. Drucker

There are at least nine noteworthy gold-producers at Kalgoorlie—the Golden Horseshoe, Great Boulder, Ivanhoe, Perseverance, Kalgurli, Associated, Lake View, Oroya Brownhill and South Kalgurli. Three

The Golden Mile, Kalgoorlie.



Golden Horseshoe Gold Mine.

of these crush their ore in Krupp ball-mills, one with Griffin mills, one with both ball and Griffin mills, and the remaining four with stamps. The two main methods of ore treatment used at Kalgoorlie may be classified as follows: 1. Dry-crushing, all roasting, all-sliming in pans, and amalgamation, cyanide agitation of slime, and filter-pressing (the Great Boulder uses the Ridgway filter). 2. Wet-crushing in cyanide, classifying, concentrating, all-sliming in tube-mills, raw slime bromo-cyanide agitation, concentrate roasting, amalgamation and all-sliming in pans, cyanide agitation, filter-pressing.

Wet-Crushing with Stamps.—Of the various Kalgoorlie mines mentioned above, the Lake View, Oroya Brownhill and the new 100-stamp mill at the Horseshoe are all-sliming. The coarse sand is ground fine in pans, and then slimed in tube-mills. (The Horseshoe employs tube-mills only for this purpose.) The Ivanhoe and the old 50-stamp mill at the Horseshoe treat the sand after a previous grinding in pans, by percolation, the slime being treated raw by bromo-cyanide agitation and filter-pressing. All these plants are wet-crushing in cyanide solution and have done away with the old plate-amalgama-

DRY-CRUSHING PLANTS

Company	*Au Tonnage per Mo (30 Days)	Water Consumed per day (gallons)	Reduction Plant: Breakers Gates	Breakers Blake	Ball Mill No. 5	Ball Mill No. 8	Griffin Mills	Roast Furnaces Edwards	Roast Furnaces Merton	Roast Furnaces Perseverance	Pans 5-Ft.	Pans 8-Ft.	Agitators Air	Agitators Mech	Filter-Presses	Ridgway Filters	Zinc-Boxes
†Great Boulder	16,706	193,200	2 No 5 4 No 3	----	----	4	12	14	■	----	22	----	----	13	----	10	16
Perseverance	18,350	92,700	1 No 5 2 No 3	----	----	----	16	----	----	6	----	14	----	24	13	----	15
Associated	11,379	79,000	2 No 5	----	13	----	----	1	19	----	20	----	----	5	9	----	7
Kalgurli	10,601	75,200	----	1 large 2 small	10	----	----	15	----	----	18	----	20	----	7	----	6
S. Kalgurli	9,037	39,500	----	1 large	1	3	----	----	10	----	2	5	----	5	9	----	5
Totals	66,073	479,600	11		4	24	7	28	30	37	6	62	19	20	47	38	10	43

* From January 1 to July 1, 1909 (Kalgoorlie Chamber of Mines figures)
† The Great Boulder has increased its tonnage to 18,200 tons.

WET-CRUSHING PLANTS

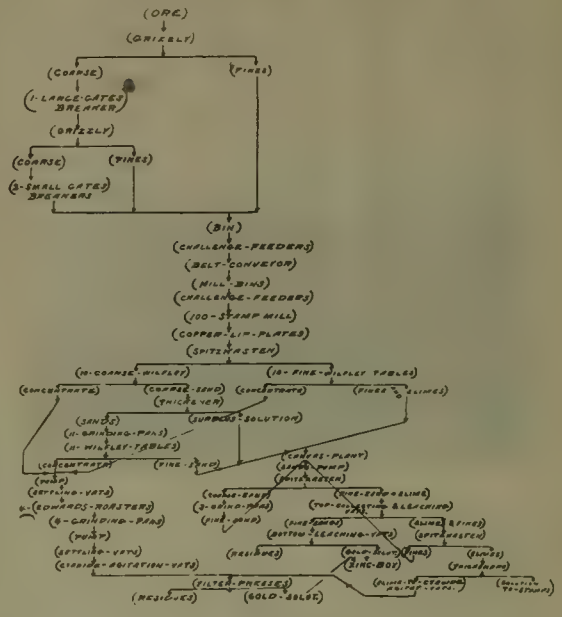
Company	*Au Tonnage Per Mo (30 Days)	Water Consumption per day (gallons)	Reduction Plant: Breakers Gates	Breakers Blake	Stamps Number	Stamps Duty, tons	Wilfley Tables	Canvas Plant	Tube-Mills	Sand Leaching Tanks	Agitators	Concentrate Treatment: Furnaces Edwards	Furnaces Merton	Grinding Cons.	Filter-Presses	Zinc-Boxes	Cassette Filter Plant (Quimby)
G. Horseshoe	23,946	127,700	2 No 5	1 Large	150	5.32	2 mill 12 Wilfley	----	10	24	24	4	----	¼ Sand ¾ Conc	20	10	----
Ivanhoe	18,983	101,200	1 No 7 2 No 5	----	100	6.33	31	2	----	32	11	4	----	¼ Sand ¾ Conc	■	9	----
Lake View	8,701	93,200	----	1 Large	70	(4.14)	19	----	6	----	20	3	----	¼ Sand ¾ Conc	13	7	1
Brownhill	11,376	200,300	----	2 No 6	50	7.58	22	----	6	----	25	----	3	¼ Sand ¾ Conc	6	8	2
Totals	63,006	522,400	5	4	370	5.67	126	2	22	56	80	11	3	54	47	34	3

* From first six months of 1909 (Chamber of Mines figures). The Horseshoe tonnage has been increased to 25,000 tons and the Lake View to 11,000 (stamp-duty is 5.24 tons).

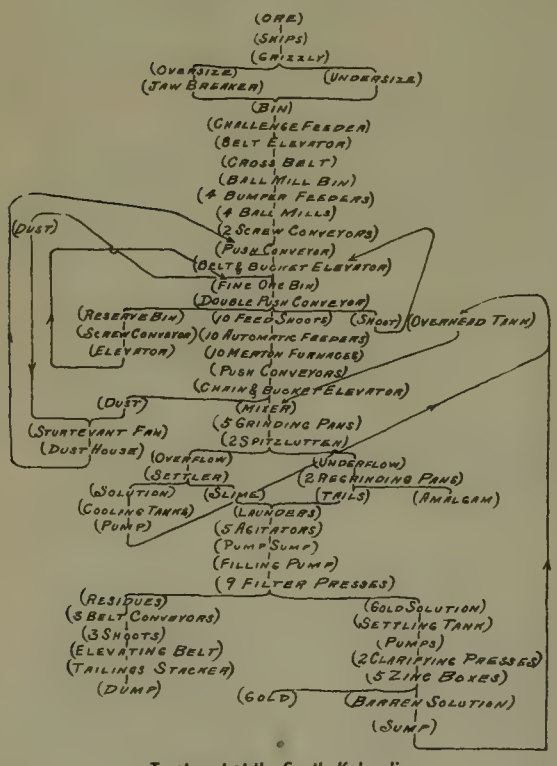
tion. All amalgamating is now conducted in the grinding pans. Concentration is done on Wilfley tables, and the concentrate obtained at these plants is roasted before receiving cyanide treatment.

Dry Crushing with Krupp or Griffin Mills.—The important dry-crushing plants of Kalgoorlie are the Great Boulder, Perseverance, Associated, Kalgurli, and South Kalgurli. These employ, mainly, ball-mills which are in high favor, and although they do not produce as fine a discharge, they are more economical in supervision, repairs, and power. The grinding-pan has played an important part in the metallurgical practice of Kalgoorlie. It has been used mainly with the all-roasting process in regrinding sand and amalgamating coarse gold. The gold won from this source varies from 25 to 35% of the total yield.

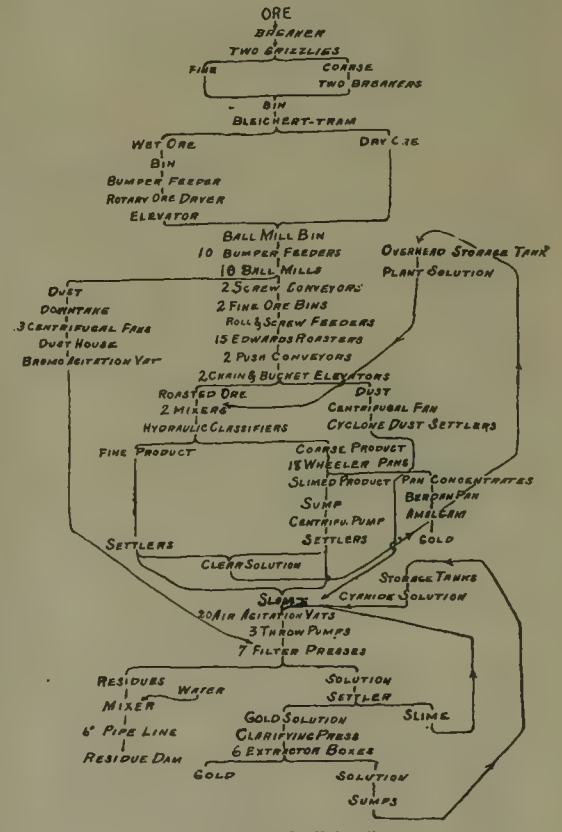
Treatment at the Oroya Brownhill.



Treatment at the Ivanhoe.



Treatment at the South Kalgurli.



Treatment at the Kalgurli.

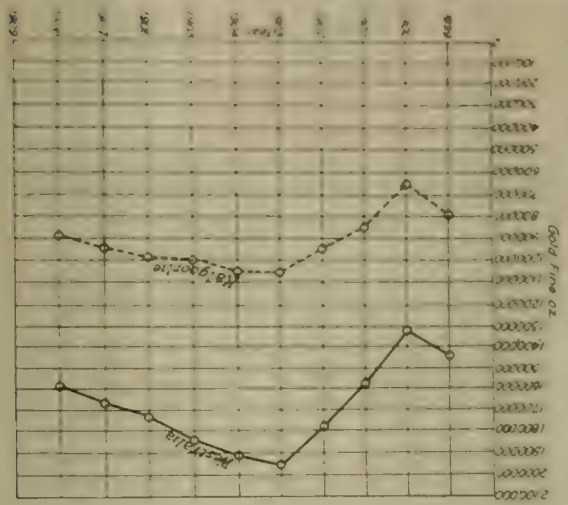
Since the discovery of gold in Western Australia, $390,374,528 worth has been produced up to the end of 1908, of which the Kalgoorlie field has contributed 10,006,627 fine ounces, valued at $206,836,980. The

total dividends for the State to the end of 1908 amount to $92,164,629 of which Kalgoorlie paid $71,163,928. During the past year (1908) the Kalgoorlie mines paid in dividends $5,925,991.

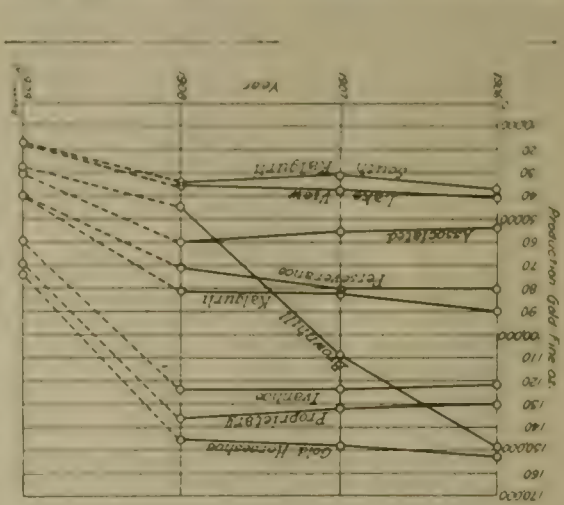
Since the production of gold began in 1903 it has been steadily falling year after year. The average yearly decrease has been for the past six years 61,040 fine ounces. The average yearly decrease since 1903

PRODUCTION OF LEADING KALGOORLIE COMPANIES

Company	Capitalization	Total production to July 1, '09 Tons	Yield	Total dividends to July 1, '09
Great Boulder	$ [illegible]	1,460,227	$ 31,763,503	$14,886,445
Golden Horseshoe	7,500,000	1,984,855	34,029,914	13,905,000
Ivanhoe	5,000,000	1,780,442	26,807,695	11,018,875
Brownhill	2,250,000	1,097,718	22,897,831	10,406,250
Perseverance	7,500,000	1,543,610	22,802,151	6,988,625
Lake View	1,750,000	1,188,456	20,136,031	6,927,475
Kalgurli	600,000	702,429	10,627,873	4,079,250
Associated	2,500,000	939,793	13,849,065	3,266,746
South Kalgurli	1,000,000	487,467	4,473,690	367,500
Totals	$28,975,000	11,171,997	$187,197,665	$71,906,136



Curves Showing Gold Production of Western Australia and Kalgoorlie.



Production of Leading Kalgoorlie Mines.

PRODUCTION OF THE KALGOORLIE GOLDFIELD

Year.	Ore Treated (tons = 2000 lb.)	Gold Yield (fine oz.)	Yield per Ton.	Dividends.
1893-1904	4,357,151	5,141,142	$24.37	$36,966,675
1904	1,284,942	1,050,922	16.88	7,429,845
1905	1,443,628	997,193	14.25	7,762,976
1906	1,656,387	989,357	12.33	7,778,926
1907	1,776,519	937,238	10.74	7,299,515
1908	1,877,872	890,775	9.77	5,925,991
(6 mo.) 1909	.....	.....	...	3,095,192
Totals	12,395,999	10,006,627	$16.68	$76,259,120

GOLD PRODUCTION OF LEADING KALGOORLIE MINES

Company.	(Fine oz.) 1906.	1907.	1908.	1909. (6 months.)
Golden Horseshoe	152,718.61	147,744.38	145,469.75	73,720
Proprietary	130,542.23	132,793.33	136,579.03	69,756
Ivanhoe	122,460.04	123,118.52	122,973.00	59,995
Perseverance	80,648.57	80,927.16	71,025.63	40,823
Kalgurli	90,645.10	81,832.80	81,970.70	40,368
Associated	54,416.42	56,023.31	60,480.63	31,268
Oroya Brownhill	148,203.10	108,793.89	45,194.41	28,817
South Kalgurli	38,391.38	32,401.01	34,948.38	17,877
Lake View	42,242.12	38,436.03	36,115.51	17,369
Totals	860,267.57	802,070.16	734,757.04	379,993
Westralia	1,736,295.29	1,671,992.88	1,596,090.76	

for Kalgoorlie district equals 28,687 fine ounces of gold. It may safely be inferred that the general depression due to declining yield of Western Australia will be relieved in a measure by the recent satisfactory developments at Kalgoorlie, Gwalia, and several of the smaller mining districts. Kalgoorlie, like

tions of telluride to free gold, occurrence of graphite, etc. The ore may be described as an altered greenstone schist containing from 50 to 70% of quartz. The mineral constituents are pyrite, pyrrhotite, and tellurides of gold, silver, and mercury.

Tellurides are widely distributed, and in some

TOTAL WESTRALIAN GOLD PRODUCTION AND DIVIDENDS

Year.	Production. (oz.)	Value.	Dividends.
Previous to 1899	2,043,355.86	$ 42,182,972.64	
1899	1,443,321.12	29,795,872.68	
1900	1,328,620.71	27,428,002.92	
1901	1,581,993.39	32,658,621.66	$46,292,865.66
1902	1,791,344.73	36,980,464.14	
1903	1,962,360.83	40,510,913.94	
1904	1,913,835.44	39,509,156.16	9,971,733.42
1905	1,840,656.49	37,998,454.32	10,534,725.54
1906	1,736,295.29	35,844,026.04	9,689,372.28
1907	1,671,992.88	34,516,565.64	8,447,472.18
1908	1,596,090.76	32,949,478.08	7,228,360.62
	18,909,867.50	$390,374,528.22	$92,164,529.70

GOLD RETURNS FOR 1908

(According to West Australian Department of Mines and Chamber of Mines)

Company		MILLED Tons (2000 lb)	MILLED Estimated Avg Value per ton	MILLED Gold Yield Fine Oz	CYANIDED Sands Tons	CYANIDED Sands Yield Oz	CYANIDED Slimes Tons	CYANIDED Slimes Yield Oz	Concentrate Tons	Concentrate Yield Oz	Total Yield Gold Fine Oz	Total Yield Value	Value Recovered per ton milled	Treatment Cost, per ton	Total expenses per ton—mining, milling, general expenses	Profit per ton milled	Total Dividends
Dry-Crush.	Great Boulder	185,245	$16.14	50,410	No Sand Treatment	—	185,245	86,165	Concentration Omitted	—	136,575	$ 2,813,445	$ 15.18				$ 1,286,250
	Perseverance	204,407	7.63			—	204,407			—	71,020	1,463,012	7 10	$ 2.92	$ 4.65	$ 2 45	171,500
	Associated	122,774	11.02			—	122,774			—	60,475	1,245,785	10.14				424,771
	Kalgurli	126,339	14.14			—	126,339			—	81,968	1,688,540	13 44				845,250
	S Kalgurli	106,823	7.16			—	106,823			—	34,942	719,805	6.73	2.96			49,000
Wet Crush.	G. Horseshoe	277,468	11.99	37,810	46,619	6,299	213,559	61,818	17,290	39,539	145,465	2,996,579	10.79				1,176,000
	Ivanhoe	227,898	12.34	36,247	103,782	20,591	104,498	35,425	19,168	25,592	122,973	2,533,249	11 11	1 99	5 02	6 09	1,176,000
	Lake View	107,170	7.88	Hand Gamb-ion	No Sand treatment	* 6,857	98,554	12,058	10,616	17,426	‡ 36,122	744,113	6.94	2.29	5.11	1.83	85,750
	Brownhill	155,772	6.48			* 481	144,936	18,259	10,836	25,571	⊙ 45,188	930,872	5.97	2.72			165,375
Totals		1,513,896	$10.53		150,401	26,890	1,305,585		57,910	108,128	734,728	$15,135,394	$ 9.71				5,379,896

GOLD RETURNS FOR 1909—(JANUARY 1 TO JULY 1)

Company		MILLED Tons (2000 lb)	MILLED Estimated Avg Value per ton	MILLED Gold Yield Fine Oz	CYANIDED Sands Tons	CYANIDED Sands Yield Oz	CYANIDED Slimes Tons	CYANIDED Slimes Yield Oz	Concentrate Tons	Concentrate Yield Oz	Total Yield Gold Fine Oz	Total Yield Value	Value Recovered per ton milled	Treatment Cost, per ton	Total expenses per ton—mining, milling, general expenses	Profit per ton milled	Total Dividends
	Great Boulder	100,235	$15 08		No Sand Treatment	—	100,235		Concentration Omitted	—	69,756	$ 1,436,973	$ 14.33	$ 2.60	$ 4.66	$ 9 67	$ 643,125
	Perseverance	110,100	8.11			—	110,100			—	40,823	840,953	7.63	2.72	4 66	2 97	343,000
	Associated	68,277	10.13			—	68,277			—	31 268	644,120	9.43	2.94	5.10	4.33	121,343
	Kalgurli	63,610	13 75			—	63,610			—	40,368	831,580	13.07	2.52	4 64	8 43	367,500
	S. Kalgurli	54,226	7.22			—	54,226			—	17,877	368,266	6.79	2.80	4 34	2.45	49,000
	G Horseshoe	143,679	11.74								73,720	1,518,632	10.57		5 42	5.15	441,000
	Ivanhoe	113,899	12.05	16,636	60,294	8,284	53,324	20,939	10,281	14,136	59,995	1,235,899	10.85	2.06	4.36	6.49	686,000
	Lake View	52,211	7.61	Hand Gamb-ion	No Sand Treatment	* 3,352	† 13,568	1,586	† 1,456	2,332	17,369	357,801	6.85	2.30	4 38	2 47	——
	Brownhill	68,256	9.34			* 5,884	† 23,007	2,696	† 1,802	4,852	28,817	593,630	8 69	2 58	4.18	4 51	110,250
Totals		774,493	$10.55								379,993	7,827,854	$ 9 80	$2.56	$ 4 63	$ 5.17	2,761,218

* Gold from vacuum-filter plant on residues treatment.
† Totals for two months—January and February.
‡ Includes 5118 oz. fine gold from slags, etc.
⊙ Includes 1358 oz. gold from slags and retreating dumps.

all other noted gold mining districts, has seen its best days, and has now settled down to production of ore of medium grade.

Telluride Gold Ores.—The refractory nature of the Kalgoorlie ores is due largely to the occurrence of the gold in combination with tellurium, forming a compound, $AuTe_2$ or $(Au.Ag)Te_2$, which is represented by the minerals calaverite and sylvanite. There is a difference in the ore at these various mines, due to variations in silica, sulphur content, proportions contribute a large portion of the total gold yield. Mines containing a notable amount of telluride are usually equipped with dry-crushing, all-roasting plants. Where tellurides occur in ores treated in wet-crushing plants, a careful concentration has to be resorted to previous to bromo-cyanide treatment. The concentrate collected is roasted before agitation with ordinary cyanide solution. Ordinary KCN or NaCN solutions are without solvent action on gold in combination with tellurium. Owing

to the variations in the ore at the different mines each property has its own metallurgical problem to solve, and hence there is a great diversity of plants and methods. It cannot be laid out to the advantage to profit from experiences gained elsewhere in treating similar ores. It can be safely said that this district was the first to successfully solve the cost treatment of gold telluride ores on a commercial scale.

The following analysis will represent the two different types of ore treated at Kalgoorlie:

	Ivanhoe Wet crushing Bromo-cyaniding Per cent	Associated Dry crushing All roasting Per cent
Silica	77.7	65.1
Ferric oxide	7.0	4.6
Sulphur	3.9	0.0
Alumina	1.5	2.4
Magnesia	3.4	5.5
Lime	5.4	6.7
Water	0.2	0.0
Undetermined	0.9	0.0
Iron pyrite	0.0	11.4
Alkalies, water, etc.	0.0	4.2
	100.0	99.9

MANGANESE IN THE UNITED STATES

The important and numerous uses of manganese or of its ores give practical interest to the many deposits in this country, which are described in detail in a report by E. C. Harder published by the United States Geological Survey as Bulletin 427.

Manganese is one of the elementary metals and was long considered a kind of iron. Pliny regarded it as a variety of lodestone or magnetic iron and it was not identified as a distinct metal until late in the eighteenth century. The ancient judgment is somewhat justified by the modern classification of manganese among the elements of the iron group, which includes iron, manganese, cobalt, and nickel.

Manganese is not found naturally in the metallic state, but occurs principally as an oxide, silicate, or carbonate. Rhodonite, a beautiful pink manganese silicate, is cut for jewels, and the purple of the amethyst is supposed to be due to the presence of manganese. Minerals containing manganese are widespread, but few are available for use as ores, for most of them contain only small percentages of the metal. The oxides psilomelane and pyrolusite are the principal ores.

Pyrolusite, which contains about 60% of manganese, was used by the ancient Egyptians in decoloring glass, that is, in making it clear or transparent, for the addition of this mineral to glass sand neutralizes or in some way counteracts the effect of iron, which gives to glass green or other undesired colors. Pyrolusite is still used for this purpose, but ores or alloys of manganese are now more largely used in making alloys with iron, steel, copper, aluminum, and other metals, in making chlorine, bromine, and oxygen, and as a disinfectant, as well as in galvanic batteries and in bleaching, dyeing, and painting.

Spiegeleisen ('mirror iron'), so called from its brilliantly glittering surface, and ferromanganese, both alloys of iron and manganese, are prepared chiefly for use in metallurgy.

COSTS PER TON OF ORE TREATED, 1908

	Brownhill.	Ivanhoe.	Lake View.	Perseverance.	
Ore breaking	$0.110	$0.083	$0.038	$0.186	Ore breaking
Ore transport	0.199	0.031	0.041		Ore transport
Ore milling	0.410	0.449	0.376	0.715	Ore milling
Ore concentrating	0.104	0.137	0.166	0.717	Ore roasting
Concentrate roasting	0.118	0.124	0.108	....	
Concentrate fine grinding	0.073	0.031	0.036	....	
Concentrate cyaniding	0.050	0.118	0.086	....	
Sand, fine grinding	0.295	0.126	0.327	....	
Sand, cyaniding by percolation	....	0.217	....	....	
Slime, cyaniding by agitation	0.752	0.292	0.616	0.484	Cyanide agitation and amalgamation
Slime, filter-pressing	0.357	0.172	0.289	0.470	Slime filter pressing.
Precipitation and smelting	0.090	0.086	0.073	0.135	Precipitating and smelting.
Disposal of residues	0.153	0.118	0.133	0.102	Disposal residues
	....	....	....	0.113	Sundry charges
Totals	$2.774	$1.984	$2.289	$2.922	

The Brownhill, Ivanhoe, and Lake View are all wet-crushing plants, while the Perseverance is dry-crushing, all-roasting. The wet-crushing process gives a net bullion extraction of 86 to 90% at a cost of about $2.30 per ton, while dry-crushing yields 90 to 94% of the gold with a cost of $2.70. It is generally conceded at Kalgoorlie that dry-crushing, all-roasting process has won, and is the most profitable method. However, I think that through increased stamp duty, screen classification, and closer concentration, the wet-crushing process will prove to be the most profitable. In places where fuel and furnace supplies are high, the bromo-cyanide process would show an advantage no doubt. The chemical process requires considerable metallurgical skill and constant attention to the progress of each vat. The alkalinity of the cyanide solutions is important, the best extraction being at about 0.01% to nearly neutral.

New Shaft Sinking Record at Corbin, Montana

By Frank J. Tuck

H. E. Emerson, manager for the Boston & Corbin Copper & Silver Mining Co., has achieved an enviable record for rapid shaft sinking at the company's mine at Corbin, Montana. From June 15 to August 20 a three-compartment shaft was sunk exactly 213 ft.; from the 400-ft. station to a point below the 600. In other words, about 100 ft. per month was made, a record for the district. It is doubtful if a three-compartment shaft of equal size, and under similar conditions, has ever been sunk so rapidly and at the same time so cheaply. The actual total cost for power, labor, timber, and supplies, was only $40.95, and this included a handsome profit check to the men who did the work on contract.

The rock through which the shaft was sunk was a dark hornblende granite, commonly known as Butte granite. The rock section of the shaft measured about 17 by 7 ft., each compartment being 4 by 4½ ft. in the clear. For wall plates and end pieces 10 by 10-in. timbers were used, the dividers being 8 by 10. The sets were spaced 5 ft. centre to centre. Only one compartment was employed for sinking; a second being used for hoisting rock from the two upper development levels; and the third as a pipe and ladderway. A double-drum, electric, geared-hoist, of Wellman-Seaver-Morgan type, with a 100-hp. Crocker-Wheeler motor, handled the cages in both compartments very satisfactorily. A straight-sided sinking bucket of about twelve cubic feet capacity was hung to the cage in the sinking compartment, and was used for hoisting water as well as broken rock. The flow of water was not excessive, about thirty-five buckets per day being hoisted.

Two Sullivan UB, 2½-in. machines, with air at 80 lb. pressure, were used, and from 18 to 25 holes were drilled per round. This included 6 cut-holes which were blasted previous to the others. The holes were from 5 to 7 ft. deep, usually averaging about 6 ft. The firing was done by caps and waterproof fuse, and there was no trouble with the electric hoist when hoisting men before blasting. Forty per cent gelatine dynamite was used, and with a regular charge, the ordinary 10 by 10 blasting timbers afforded satisfactory protection to the lower sets. It is doubtful if this would have been the case if batteries had been used for firing. Station sets were put in at the 500 and 600-ft. levels.

The contract for sinking the shaft was awarded to three miners who agreed to furnish their own supplies and do the drilling, blasting, shoveling, and timbering. Each of these miners took charge of an eight-hour shift and had three other shaft men working with him. Co-operation and hard work seem to have been the key-note of their success. No miners ever worked with more vim, intelligence, and enthusiasm. The timbering was perfect, the whole 213 ft. being exactly plumb. While the men were paid $4 per day for their labor, their profit check netted them a snug sum, and there is no doubt that the company was given handsome returns.

The cost per foot of shaft was as follows:

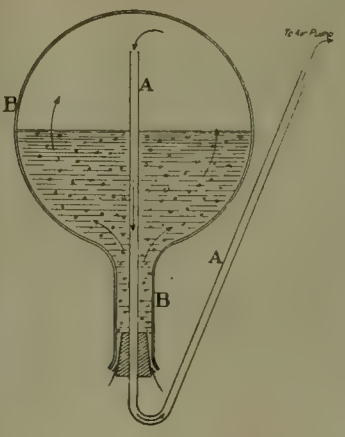
Labor, cost per foot	$32.76
Lumber, per foot	4.58
Supplies, powder, caps, fuse, candles	2.04
Power	1.57
Total	$40.95

Besides the power and timber, the company furnished top-men, engineers, blacksmiths, and carpenters. One carpenter succeeded in keeping the shaftmen supplied with timbers, and the blacksmith and helper supplied the whole mine with sharpened steel. Three other machine drills were in use in the mine besides those in the shaft. The wages paid were as follows: Engineers, $4; shaftmen, $4; blacksmith, $4; blacksmith helper, $3.50; carpenter, $4.50; topmen, $3.50.

LABORATORY AGITATION APPARATUS

By George A. James

The apparatus illustrated below is designed to furnish a simple method of duplicating the operation of the Pachuca agitator for laboratory experimental work. In the figure A is a tube bent, as there shown and of such length that it will reach quite close to the bottom of flask, B, when introduced through the loose fitting cork, and which extends about the same length outside the flask. I select for the cork one that is porous, or, if necessary, scar the cork so that air can pass between it and the neck of the flask, but do not leave sufficient space to let the contents of the flask pass out when the same is inverted. The material for treatment is introduced and the cork is entered loosely enough to permit the passage of air, but tight enough not to permit it to fall out under the weight of the contents of the flask. Tube A is then connected up with a Bunsen, or Richardson suction pump, and the flask, with contents, inverted. It will be seen that this produces a partial vacuum, which in turn draws the air around, and through the cork, and this, by being passed through the pulp, gives any degree of agitation and aeration.



Where I have a number of tests to run simultaneously, I use a tight fitting cork, and instead of the air passing around it, a bent tube which just enters above the cork, and which extends above the level of pulp, outside of the flask is substituted. This can be connected to another apparatus, the air passing from one flask to the other in sequence.

Rand Mine Returns and the Fathomage System

By W. W. Mein

***Abuse of 'Ton Milled' Unit.**—In his recent address H. F. Marriott drew an alarming picture of the abuses of ordinary methods scarcely gratifying to men in any positions of authority responsible for the control of Rand mining in recent years. Although Mr. Marriott is but a moderate supporter of 'wholesale' mining, his imputations of incompetence or dishonesty against Rand managers are certainly conducted on wholesale principles, without much thought of selection. He asserts that "all other economic considerations have bowed before the overwhelming flood of reducing costs per ton milled." If all economic considerations had been swept aside in favor of low costs per ton, surface quarrying on the outcrop mines would alone be seen today and there would be no tube-mills to effect such a costly refinement as high extraction. According to the accusation, responsible control has been too lax, and yet the new system of mine returns is proclaimed as the 'emancipation' of the mine manager. Mr. Marriott argues that the 'ton milled' is objectionable in that it is "whatever the manager chooses to make it." This statement suggests confusion of ideas, for the ton is an absolute unit. The grade of the ton, certainly, is whatever an irresponsible and uncontrolled manager might choose to make it—with limits only on the side of richness—but the ton or an equivalent in cubic measure does not cease to be a definite unit of equipment capacity. Neither the ton milled, nor the fathom stoped, nor the ounce of gold won, however, can be employed as a general unit to produce a summarized tabular statement automatically enforcing those desired conditions—careful mining, close attention to value of the ore, and systematic investigation of the relation between results and estimates.

Low Working Costs.—Mr. Marriott has cited a supposedly typical instance of low working-cost abuses that provides an excellent means of concentrating discussion. The assumption is that there is a ton of 30s. ore, costing 20s. to treat, and therefore yielding 10s. profit. In the hanging wall there is another ton of 15s. ore which "comes into the stope for nothing." The case against low costs is stated as follows: "The reduction of working cost is 2s. 6d. over the whole rock extracted. In place of one ton at 20s., there are two tons at 17s. 6d., which equals 35s. working cost; the gold extracted is 45s.; the profit is 10s.; the same as before over the same area. The limit of advantage in this practice is that the 15s. coming in balances the 15s. going out, and the profitable result is *nil*." A faulty conclusion is reached owing to the employment of abnormal figures. With 20s. cost for the richer ton, the additional ton, costing nothing to break, could not cost a further 1s. under any rational apportionment of expenditure. The 20s. cost of the first ton is presumably made up roughly of the following costs per ton milled: stoping 6s., shoveling and tramming 2s. 6d., hoisting, pumping, etc., 2s. 6d., surface 1s., development 2s. 6d., general and head office 1s. 6d., total 20s. The extra ton by hypothesis bears no stoping cost (6s.) and its development (2s. 6d.) has already been paid for. Shoveling costs will be lower per ton in the wider stope, and tramming cheaper owing to the greater concentration of labor. These charges will then be about 2s. per ton, and hoisting, etc., about the same figure (2s.). General and head office, pumping, and all fixed charges are included in the 20s. expenditure on the lower ton. The extra cost for the upper ton is therefore 8s., or at most 10s., and the extra profit 5s. to 7s., with the profit on the lower ton increased to 11s. The total profit is thus 16s. to 18s. for two tons, in place of 10s. where one was excluded. Yet Mr. Marriott estimates that the extra ton would only be treated for the "craze of keeping a full mill going." This reference to idle stamps clearly shows that he does not wish it to be estimated that another ton of 30s. ore could be treated in place of the 15s. rock left in the hanging. Such an assumption would promptly raise the question of increased stamping capacity.

Rich Ground Deferred by Mining Poor.—When the question of the displacement of richer ground is introduced, the viewpoint changes. We may, for sake of lucidity, still assume the condition of a stope width worth 30s., with an equal width above to 15s. I have already indicated the probable loss through leaving the 15s. ore, when stamps are idle and when no richer ore can be assumed to be displaced thereby. When all the stamps are or could be employed on 30s. rock, with 10s. profit, the often difficult question arises whether it would not pay to leave the upper ton so as to increase the present worth of future returns. The question involves a great deal of judgment as to the higher expense involved in returning to old workings and as to the actual loss of ground it may not pay to recover at all. The relative value of the two grades is further of critical importance. Where a single ton yields 10s. profit and the two tons mined simultaneously 16s. to 18s. profit, it would certainly pay best, under typical conditions and where, as assumed, the 30s. and 15s. ore can be stoped conveniently together in one stope width, to exhausth the area and abandon it. The exclusion or inclusion of the upper bands and the consequent reduction of working cost and grade per ton milled are questions bringing us back to Mr. Marriott's quotation of European shareholders, who are said to argue that the 2s. reduction in cost is no good to them, because they do not get the extra 2s. profit. While the yield per ton has fallen correspondingly with profit and cost per ton on many mines, there has generally been an increase in tonnage and total profit, as recognized in a strangely ironical reference by Mr. Marriott to "magnificent outputs," as though such things in gold mining were cause for shame. The increase of mill tonnage has been coincident with a fall in grade, for the reason

*Abstract from advance proofs, subject to revision, of an article presented to the Institution of Mining and Metallurgy.

that, generally speaking, it has been the considerations of the lower-grade ore that has justified the augmented equipment.

Mr. Marriott apparently wishes to combine the selective grade of the small equipment with the large tonnage of the big. It is by losing sight of the fact that the capacity of plant is governed by the claim area and the probable tonnage of ore per claim (controlled by a pay-limit dependent in large degree upon scale of operations) that the opponents of low working costs per ton milled fall into error. Again, considering the case of the mine with a 3-ft. stoping width at 30s. and an additional 3 ft. of 15s. ore in the hanging, this condition would warrant in practice the erection of equipment from 50 to 100% greater, if the two grades were mined coincidently, than if the richer were stoped alone and the poorer left indefinitely for subsequent extraction. In the first case every foot of development opens twice as much ore for early milling requirements as in the latter.

Here arises a clear-cut issue between the low-cost big-scale practice of mining and the 'new policy.' The selective policy would involve operations on a scale indicated by the 30s. ore, leaving the 15s. ore in the hanging, either to cave or else to be supported by filling, for recovery at a considerable risk and expense when the richer ore had been exhausted. The wholesale policy would involve the treatment of the two grades in conjunction; the greater tonnage of assured profitable ore warranting the erection of additional stamps or tube-mills to meet the maximum profit requirements of the mine. When narrow widths and high costs prevail, the uncertainty of being able to establish later the low costs essential for the low-grade ore to be ranked as a profitable asset, prohibits the inclusion of the deferred ground as a factor in the calculations of the scale of treatment.

The issue is most clearly indicated by the following simple example, still utilizing Mr. Marriott's grade figures. A mine contains 10,000,000 tons of mill ore worth 30s. and 10,000,000 tons of associated 15s. ore. Scheme (1) taking the reefs singly, the mine is equipped with plant treating 500,000 tons per annum; (2) taking the two grades in a single stoping width, the greater security of payable tonnage would warrant an increase of at least 50% or 250,000 tons in annual capacity. This would allow one ton of the poorer ore to be mined to two tons of the richer. In this latter case the yield per ton is 25s. and the working cost (as indicated previously) would be made up as follows: 1 ton of 30s. ore at 20s.; combined stope width, 1 ton of 30s. ore at 19s., 1 ton of 15s. ore at 9s. This is equivalent to three tons averaging 16s. per ton, giving a profit of 9s. per ton as against 10s. The small difference in profit per ton in this case, following logically Mr. Marriott's figures, reveals strikingly the common fallacy that because certain ore in a mine—as in the hanging or foot-wall—contains less gold than average working costs, it is making no profit. Its own cost may be well below the average, apart from its influence in bearing a share of the standing charges. (For simplicity, Profits Tax is omitted from all comparisons.)

RESULTS UNDER SCHEME 1

500,000 tons per annum at 10s. profit	£250,000
Life on rich ore	20 years
Factor at 7% interest and 3% redemption	9.32697
Present worth	£2,331,743

At the end of this period there would remain 10,000,000 tons averaging 15s. per ton in caved or filled stopes, the recoverable portion of which would be doubtful. There would be no development costs, this expense having been wastefully borne during the previous 20 years. Assume favorably that all is recovered at a cost of 12s. per ton or 3s. profit, as follows.

500,000 tons per annum at 3s. per ton	£75,000
Factors—20 years life deferred 20 years	2.68331
Present worth	£201,248
Add first period	£2,331,743
Total	£2,532,991

RESULTS UNDER SCHEME 2

750,000 tons per annum at 9s. per ton	£337,500
Life on combined ore 20 years, factor 9.32697	£3,147,852
There will remain 5,000,000 tons at about 3s. profit, producing at 750,000 tons per annum	£112,500
Life 6.667 years, deferred 20 years, factor	1.19739
Present worth	£134,706
Add first period	£3,147,852
Total	£3,282,558

The difference in favor of Scheme 2, is £750,000 or 29%; approximately half a million after allowing for extra capital expenditure involved in erection of the additional plant. It would, of course, be unreasonable to argue that a better result might be obtained by working only the richer ore at 750,000 tons per annum and deferring the poorer; for we start off with the assumption that the 30s. ore is treated on the maximum scale of 500,000 tons per annum.

This is a theoretical case founded on the typical figures advanced by Mr. Marriott. Summarizing the results of the Central Administration group for 1906 and 1908 (the period of striving after low costs, big tonnages, and "magnificent outputs") yields the following comparison:

	1906, s. d.	1908, s. d.	s. d.
Cost per ton milled	22 5	17 5	Decrease 5 0
Yield per ton milled	38 10	37 5	Decrease 1 5
Profit per ton milled	16 5	20 0	Increase 3 7

These figures show a total increase in profit of £730,000, or exactly 50%. This must surely be considered a beneficial result of the "craze for keeping the full mill going" and greedily asking for "more stamps."

Quarterly Reports on the Fathom System.—Under the new system of compiling mine returns, the test of good management and policy will appear in the progress of quarterly records of "profit per fathom." This blind striving for "maximum profit per fathom" involves serious dangers. A high return per fathom might be obtained for a period by selection of a character that is dearly paid for in the course of time. It might be effected most easily

by the passing of the mine resulting in the disorganization of subsequent operations, a misleading representation of the profit-earning capacity of the ore reserves and a loss of the confidence of the investing world. As that is needless in the new returns to prove too much in connection with the systematization of Rand records must reach unattainable heights before the proof of good management can be revealed in a figure in part based on the manager's judgment and capable of substantial alteration at the stroke of a pen. It may of course be contended that these new returns will have to be checked by the controlling interests but if these controls and managements were incapable of exercising intelligent supervision under the ordinary systems, giving a far more detailed and rational view of conditions, how can they be trusted to handle capably a new system that is necessarily based on the old for its proper compilation, however much that dependence on the tonnage unit is concealed?

Maintaining Development.—"Note No. 1. Average percentage of payable to total ore based on the working results obtained during the past year. To be utilized in comparing fathomage developed and stoped. As a general average for the whole mine the limit of payability is governed by column 11.

"Col. 1. Areas developed on plane of reef in square feet: South Reef, Main Reef, Main Reef Leader.

"Col. 1a. Total area in square fathoms.

"Col. 2. Areas stoped out on plane of reef in square feet: South Reef; Main Reef; Main Reef Leader.

"Col. 2a. Total area in square fathoms."

These columns are compiled in parallel in order to demonstrate the relation of ore developed and stoped on the new basis, and to show readily, in conjunction with the past year's estimate of percentage of payability, whether development is being maintained. Here, immediately, appears a serious fallacy, due to the attempted evasion of the stope-width factor. Mr. Marriott has stated in explanation: "Column 1 or areas developed should total at the end of each year more than the areas stoped out in column 2 by the percentage required under the payability estimate. Otherwise the mine will be falling behind in its development." This is a delusion and provides a good instance of the deceptiveness of this method of investigation. However much Mr Marriott may try to eliminate the influence of variations in reef width, he is baffled by hard facts. The fallacy of the argument may be shown by the following simple figures for a year: mill capacity 80,000 tons per month; percentage payable 100; area developed 120,000 fathoms (3 ft. stope width); area stoped 100,000 fathoms (5 ft. stope width). According to Mr. Marriott this mine must be increasing its payable reserve, owing to the excess fathomage developed. In point of fact, only 1,080,000 minable tons were developed as against 1,500,000 tons mined, and the ore reserves fell back by nearly five months' mill supply. The usual records of tonnage developed per quarter, though always liable to adjustment upon the compilation of ore reserves, therefore give a reliable index as to the maintenance of payable ore reserves, while the new scheme may give a wholly erroneous showing.

Here again the adoption of the previous year's percentage of payability would represent most colorable facts. It indicates a spirit of "emancipation" certainly, but as I have mentioned in discussing monthly development records on the tonnage basis, it is preferable to be the slave of reliable sampling averages than merely free from care through wilful ignorance of facts. The figure the manager is to be guided by is the percentage payable of last year's development, which may have been 90%. This year he strikes bad ground and the true percentage payable is only 45. For every 90 fathoms he stopes he will be developing 100 fathoms instead of 200, and create the false impression that there is no falling off in ore reserves. If a mine consistently develops poorer ground, year by year, the manager would always be a year behind in his standards. Further, the percentage payable for the year will be based on all reefs, while the ratios in which they are worked are apt to be changed frequently, creating further discrepancies between the true and represented conditions of relationship between added and exhausted ore.

Column 3. Resultant average stoping widths by actual measurement: South Reef, Main Reef Leader, Main Reef, Total.

Mr. Marriott explains: "The actual stoping widths taken in the wake of mining operations will, in conjunction with figures for areas stoped, enable the true tonnage extracted from the mine to be calculated. Discrepancies with this figure in treatment operations will have to be investigated and corrected."

The only average stoping width obtained by actual measurement is that employed every month by mine surveyors in relation to normal stoping. This figure is carefully compiled under existing systems, already described. It is compared with the width calculated from the tonnage trammed, and investigated if unusual. The figures cannot with reason be extended to the uses involved in Mr. Marriott's return. The ore from development faces, from packs, sweepings, foot-walling, and from those miscellaneous sources comprising so important an item, especially in old mines, cannot be given an accurate stope width any more than they can accurately be credited with 'fathomage.' Either a fathomage must be estimated and a stope width deduced therefrom, or else a stoping width estimated (or taken, without rhyme or reason, at the average for normal stopes) and a fathomage deduced. Whichever arbitrary method is adopted, the result is the product of the manager's 'judgment' and at the same time an important factor in the estimation of that figure "by which good management is judged." It may prove good management of figures, but ability in mine management cannot be determined by any such simple means.

Columns 4 to 8. Relation between gold won and reserve values.

The principle of combining the two distinct fac-

tors—discrepancy in ore-reserve estimation and loss of gold in residues—is reprehensible and will not serve to impress shareholders with the efficiency of either department. A perfect agreement between gold won and estimated, after allowance for metallurgical extraction, might be regarded as good work, when in reality due to an underestimation of ore reserves. If, for example, in the estimation of reserves it is calculated that certain bands will be left in the hanging and in actual practice they come into the stope, it is clear that a high percentage of recovery will be shown, owing to the gain of extra gold not recorded in the original figure of block content. A comparison between the gold content estimated for a block and that won is at all times useful, but when the comparison is carried to the pitch suggested by Mr. Marriott it becomes deceptive. Mr. Marriott arrives at a faulty conclusion for the reason that he loses sight of this simple fact that the ore reserves of a mine are made up of a number of blocks at various stages of attack and valued with varying degrees of accuracy. The average value of the reserves is made up of a range of probabilities, from factors of practical certainty down to provisional estimates of comparatively poor foundation. In entering up the estimated value of the block in its original form, before stoping has added its important evidence, a figure that is admittedly provisional is used. The gold won from a single block, as initially valued, may be 70 to 130% of that estimated upon the inadequate information of development, and yet the gold won from total ore reserves, including all the worked and well-proved blocks, only 5% short or in excess. The claim made that the new system will reduce clerical work cannot be admitted. Unfortunately the needless labor and responsibility will fall chiefly on the shoulders of the higher officials—mine manager, secretary, and chief surveyor—whose time would be far better occupied in attending to economically essential matters.

Working Costs.—Broadly, Mr. Marriott divides the costs into two main heads (1) those inside, and (2) those outside the stope. The former are based on actual costs per fathom and are therefore approximately correct, but the latter—representing the greater proportion of the cost of mining—are apportioned in a grotesque fashion. The costs of tramming, hoisting, breaking, milling, etc., are suggested to be distributed on the fathomage basis without reference to tons at all. No mention whatever is made by Mr. Marriott of stoping width or tonnage. Thus all fathoms in the mine, for which costs are segregated to the different blocks with supposed refinement, will be debited with an equal cost for tramming, etc., irrespective of whether that fathom means 27 tons or 9 tons. While one block may be run at a big loss and the other at a big profit, Mr. Marriott's method may represent that each fathom yields the same profit. On the face of it, this is wrong. Mr. Marriott is very strong in his condemnation of mining wide stopes of low-grade for the sake of "magnificent outputs" and low costs. He claims that his "square fathom basis" will show this up and "emancipate" the manager. This throws new light on the nature of the emancipation. Citing specific figures, it is clear that the manager would be treating 12s. ore and appear to be making a profit, while on the old tonnage basis the unpayability of the ground would be evident and the ground would be left.

Column 12. Total distributable profit obtained (6—11a).

This is the soundest column in the whole return, representing a figure that is absolute and important. Unfortunately it is not allowed to stand uncontaminated, for in column 13 its value is dispelled by the application of a fictitious divisor—total fathoms stoped. In reality, this divisor represents the true fathomage of virgin stoping (used freely in the tonnage system of mine returns in its proper applications) plus an addition, according to taste, for development rock, reclaiming, packs, etc. By this column, profit per fathom, "good management will be judged." Consider the position of the manager of a mine with declining grade or of the manager taking over a mine after one of the "emancipated" slaves of economy has been at work for a year. The narrow high-grade blocks have been depleted and to keep any mill running at all, he puts through the lower grade, wide 'reef' which shows as much gold per fathom as the other, but costs twice as much per fathom to treat. This manager may raise the efficiency of every department, per unit of work, may collect the most skilful staff on the Rand, fill his mine with the most competent miners, may eradicate every weak spot in the operation of the mine, and yet he will be doomed under the infallible and merciless tyranny of column 13. He can offer no excuses—the "yield per fathom" has remained unchanged, the costs per fathom are expected to remain unaltered, therefore the profit per fathom must not fall or else column 13 judges and condemns him. Another claim advanced in support of column 13 is that "the progressive results will automatically induce greater speed in development, closer mining, and a higher degree of sorting, all of which make for greater profit." Being a sweeping assertion, without proof or support, it need not be met with detailed criticism. However, it may at least be suggested that the slow process of automatic induction through the leisurely guidance of quarterly returns is not the best available for deciding these ever changing calls of policy. In any case, Mr. Marriott is clearly under a delusion when he declares that greater speed of development, closer mining, and a higher sorting must lead to greater profit. On the contrary, there must be an economic limit, governed by current practical conditions, and when that limit is exceeded there can, by hypothesis, be no improvement.

Ore Reserves.—The treatment of ore reserves under the new policy raises a big question. In Rand practice, there is no such segregation and as a general rule 'ore developed' does not necessarily mean ore blocked out in readiness for stoping, but that ore which can be 'safely valued,' with due consideration for compensation of errors in the blocks of less thorough exposure. This introduces the element of judgment, but in any intelligent estimate of ore

reserves, promising to give results borne out by subsequent operations and at the same time representing the utmost knowledge of the property available this factor must be employed. If ore ready for stoping is alone considered reserves on the Rand would be greatly reduced and the position would be presented to shareholders in a dangerously unfavorable light, deceiving all save those intimately acquainted with the position in the mine. Mr Marriott wishes to attach excessive importance to the winze connections His arguments are, however contradictory. First, he says that he wishes to induce European shareholders to base their estimates of share valuation for market purposes on the payable ore reserve, rather than the gold returns. This is a wise procedure, and one that will be doubly advisable when managers are driven by column 13 of the new returns to work out the blocks suitable to its requirements regardless of future economy and the ultimate maximum profit to be gained from the mine.

Later on, he states: "The area developed during the year will include only all reef which is available for stoping, without further winzing and raising. A system has been started since I left of stating that a drift of itself develops a certain amount of ore in the reef standing above it. A drift unconnected with other drifts develops nothing but itself and the rock that is taken out of it. If this were not so, then what have you developed when you have put through the necessary winzes and raises? You have already credited the drift with the development and therefore these latter show no further area opened up, whereas this extra work is essential before the ore reserves can be attacked." Under ordinary systems, the winzes do not add to our reserve. They merely increase knowledge of the reserve in the same way as subsequent stoping gives still further information. They do not add to the reserve of proved ore—though without them the blocks are valued with a rather lower degree of safety—but merely add to those ready for attack. This is a point about which the investor, whom Mr. Marriott quotes as an influence in his decisions, can care nothing. His estimates of the future must be based on the grade of ore that can be valued in the judgment of the company's engineers, whom he has perfect right to assume are maintaining an ample length of stope faces to meet mill requirements. It would be absurd, for instance, to give a mine a low valuation merely because at some period the winze connections were insufficiently advanced, while the reef disclosures of advance driving were of increasing richness. Compared with the work of driving—of having the shafts down and the levels out—the work of winzing and raising is almost insignificant. By enforcing the system of reckoning as ore developed only such areas as are blocked out for stoping, although other stretches of ore can be valued with very little less security, would mean withholding from shareholders information possibly of vital importance. How, then, can the introduction of such a scheme be of benefit to shareholders whom Mr. Marriott is aiming to serve? Another tendency of the proposed restriction of ore to that ready for stoping will arise in the non appearance in estimates of that ground of doubtful payability the winzing through which is delayed in favor of the richer ore. A strip of ore between the two levels will be known to be of poor grade and thus reduce the value of the payable ore or increase the percentage of unpayable but not being winzed through will be omitted from the estimate. I admit that the whole question of ore reserve estimation on the Rand is one that would repay detailed investigation, so that, for the benefit of the whole field, uniformity might be established in the crucial points. But I consider Mr. Marriott's criticism and proposal are not applicable to the Rand. This is a technical question regarding which I should like to hear other local opinions, although its treatment may have little bearing on the new fathomage system. Regarding the application of the fathom to the presentation of ore reserves, it is difficult to frame condemnation too emphatic. In the first place—and this must be fully insisted upon—there is no connection between the grade of a mine and the 'gold content' per square fathom. As previously shown, a fathom representing the same gold may be 12s. ore or 36s. ore. A mine may therefore have treated in one year 50,000 fathoms at £15 per fathom with a profit of £3 per fathom and be shown to have an ore reserve of 100,000 fathoms at the same value per fathom and yet not have a single payable fathom in the mine.

Again, there is no fixed relation between the inclined area exhausted and the claim area, and the fathom as a unit of equipment capacity is meaningless. Even an engineer with inside information would have to convert his fathoms into tons before he could make any estimate of the life. It would be interesting to learn, however, how such an impartial authority as the Government Mining Engineer would view the matter upon receiving an estimate of life, for Profits Tax amortization purposes, based on the argument that because 50,000 fathoms were treated in 1909, the remaining 250,000 fathoms means a five years' life. Information would surely be demanded to indicate whether these 250,000 fathoms represent two million tons or five—a four years' life or ten. Just as there is a complete lack of definite expression in the use of the square fathom as a unit of equipment capacity, so is it a factor of dangerous looseness in its recognition as a fixed proportion of claim area, especially when made to bear responsibilities in the new quarterly returns, which the 'ton milled' is not, and could not, be expected to carry. It is true that a property of 1000 claims contains 1,778,500 square fathoms on the horizontal, or 2,050,000 square fathoms on the incline at a dip of 30 degrees, but it is not in reference to one of these fathoms that results are shown. This is where a false impression of the unit's significance may arise. The fathom employed is given as the fathom 'stoped' on all reefs. Assuming, for sake of argument, that this could be definitely shown, then on a mine with two or three reefs, each with varying degrees of payability, the total fathomage providing the units, may range from 2,000,000 to 6,000,000, according to the percentages of each reef mined and the scheme of

working. This circumstance suggests why no such extravagant importance should be attached to profit per fathom or any other unit, but should give greater weight to total profits and the maximum present worth of the whole property.

Pay Limit.—In regard to pay limit, Mr. Marriott has fallen into a most inviting trap. He stated in his address: "You have hitherto taken your mine working cost as the dividing line on which to base the payable reef standing in your mine. The standard of mine working costs, although it has not been varied to the extent that the tonnage milled has suffered from time to time, is still an unstable figure of comparison. Many of the necessary items of company expenditure are excluded, and without going into detail I can simply express the position by stating that the Profits Tax is just as much an item of working cost as the running of the mill." This presumably means that the pay limit will be raised, say, 1s. 6d. per ton in respect to Profits Tax and will throw into the unpayable class those blocks of ore estimated to stand between the old and the new limit —say 18s. and 19s. 6d. In other words, the blocks transferred from the payable to the unpayable, because they are estimated to yield no profit at all, are nevertheless being charged 1s. 6d. per ton in respect to a 10% tax on their profits. This is manifestly wrong. Whether Mr. Marriott means the Profits Tax to be added, at the mine's average figure, to the pay limit and thus charged against the barely profitable blocks with the false results mentioned is not quite clear. He has certainly stated: "In a properly equipped and developed mine only those blocks of ore should be worked which contain gold of an estimated value greater than the total cost incurred by the company in working them, under column 11." This figure does include the average Profits Tax. Elsewhere, however, he says: "Each section of rock must stand absolutely on its own merits, regardless of the cost or profit from any other reef section."

Disregarding the contradictory nature of these remarks and giving Mr. Marriott credit for not intending to charge a block showing a probable profit of 1s. per ton with 1s. 6d. for a 10% Profits Tax, it may be assumed that it is intended to charge against each block its own estimated tax. In this case it will be seen that while the rich blocks are bearing a Profits Tax above the average, the low-grade blocks are charged with a tax that gradually diminishes to zero as the old pay limit of working and general expenses is reached. Thus, there will be no change whatever in the pay limit, for the simple reason that those blocks which are on the pay limit cannot be debited with any tax and therefore the effect of Profits Tax on pay limit and the classification of payable and unpayable would be literally and absolutely nil. Thus the addition of Profits Tax to the pay limit, of which so strong a point is made under the new scheme, is fallacious in its influence, if based on the mine's average figure, or else it effects no change whatever, if added proportionately to the estimated profit of each block.

CAPACITY OF CIRCULAR VATS PER FOOT OF DEPTH.

By W. A. Caldecott*

1 Ton = 2,000 Lbs. = 32 Cub. Ft. of Solution. Sp. Gr. of Dry Slime = 2·7.

Diameter of Vat in Feet	Circumference of Vat in Feet.	Area of Vat in Square Feet.	Cubic Feet per Foot Depth.	Tons of Dry Sand per Foot Depth. Collected.	Leached	Treated	Tons of Solution per Foot Depth.	Slime Pulp. Percentage of Moisture. 30%	32·5%	35%	37·5%	40%	42·5%	45%	50%	1 to 1½	1 to 2	1 to 2½	1 to 3	1 to 3½	1 to 4	1 to 4½	1 to 5	Ratio of Dry Slime to Solution.
								1·788	1·739	1·693	1·649	1·607	1·567	1·530	1·459	1·337	1·266	1·219	1·187	1·163	1·144	1·129	1·117	Sp. Gr. of Pulp.
				Cubic Feet per Ton.				25·56	27·27	29·08	31·05	33·19	35·35	38·01	43·89	59·79	75·75	92·00	107·75	123·62	139·91	156·18	172·20	Cub. feet of Pulp per ton Dry Slime.
				21·5	24	26	32	Tons of Dry Slime per Foot Depth of Pulp.																Diam. of Vat in Feet.
5	15·71	19 63	913	·818	·755	·613	·768	·720	·675	·632	·591	·552	·516	·447	·328	·259	·213	·182	·159	·140	·126	·114	5
6	18·83	28·27	1·31	1·18	1·09	·883	1·106	1·037	·972	910	·852	·710	744	·644	·472	·373	·307	·262	·228	·202	·181	·164	6
7	21·99	38 48	1·79	1·60	1 48	1·20	1·51	1·411	1 32	1·240	1·16	1·083	1·01	·876	643	·508	·418	·357	·311	·275	·246	·223	7
8	25·13	50 27	2·34	2·09	1·93	1·57	1·96	1·843	1·73	1·620	1·51	1·415	1·32	1 15	·841	·664	·546	·466	·407	·359	·322	·292	8
9	28·27	63 63	2·96	2·65	2·45	1·98	2·49	2·333	2·19	2·048	1·92	1 791	1·67	1 45	1·06	·840	·691	·590	·515	·455	·407	·369	9
10	31·42	78 54	3·65	3·27	3·02	2 45	3·07	2 880	2·70	2·529	2·36	2·211	2·06	1·79	1 31	1·03	·855	·728	·633	·561	·503	·456	10
11	34·56	95 03	4·42	3 96	3 66	2·97	3·72	3·483	3·27	3 061	2·86	2 675	2·50	2·17	1 59	1·25	1·03	·882	·769	·679	·608	·552	11
12	37·70	113·10	5·26	4·71	4·35	3·53	4·42	4·147	3·89	3·643	3·41	3·183	2·98	2·58	1·89	1·49	1·23	1 04	·915	·808	·724	·657	12
13	40·84	132 73	6 17	5·53	5·11	4·15	5·19	4 867	4·56	4·275	4·00	3·736	3·49	3·02	2·22	1·75	1·44	1·23	1 07	·949	·850	·771	13
14	43·98	153 94	7·16	6·41	5·92	4 81	6·02	5·645	5·29	4·958	4·64	4·333	4 05	3·51	2·57	2·03	1 67	1·43	1·25	1·10	·986	·894	14
15	47·12	176·72	8·22	7·36	6·80	5·52	6·91	6·480	6·07	5·691	5·32	4·974	4·65	4·03	2·95	2·33	1 92	1 64	1·43	1·26	1·13	1·03	15
16	50·27	201 06	9·35	8·38	7·73	6·28	7·87	7 373	6·91	6 475	6·06	5 659	5·29	4·58	3·36	2 65	2·19	1 87	1 63	1 44	1·29	1·17	16
17	53·41	226 98	10·55	9 46	8·73	7·09	8·88	8·323	7·81	7·310	6·84	6·388	5 97	5 17	3·80	3·00	2·47	2 11	1·84	1·62	1·45	1·32	17
18	56 55	254 47	11 84	10 60	9·78	7·95	9·96	9·331	8·75	8 195	7·67	7·162	6 69	5 80	4 26	3 36	2·77	2 36	2·06	1·82	1·63	1·48	18
19	59·69	283 53	13·19	11·81	10·91	8·86	11·09	10 397	9·75	9·131	8·54	7 980	7·46	6·46	4 74	3·74	3 08	2 63	2 29	2·03	1·82	1·65	19
20	62·83	314·16	14·61	13·09	12·08	9·82	12·28	11·520	10·80	10·118	9·47	8·842	8·26	7·16	5·25	4·13	3·42	2 91	2·54	2 24	2·01	1·83	20
21	65·97	346·36	16·11	14·43	13·32	10·82	13·55	12·701	11·91	11·155	10 44	9 748	9 11	7·89	5 79	4·57	3·76	3 21	2·80	2·48	2·22	2·01	21
22	69·12	380·13	17·68	15·84	14 62	11·88	14·87	13 939	13·07	12·243	11·45	10·699	10 00	8·66	6 36	5·02	4·13	3·53	3 07	2·72	2·43	2·21	22
23	72·26	415·48	19·32	17 31	15·98	12·98	16·26	15 233	14·29	13·381	12·52	11 694	10·93	9·47	6 95	5·48	4·52	3·86	3 36	2 97	2 66	2·41	23
24	75 40	452 39	21·04	18·85	17 40	14·14	17·70	16·589	15·56	14·570	13·63	12 733	11·90	10 31	7·57	5·97	4·92	4·20	3·66	3·23	2·90	2·63	24
25	78·54	490·87	22·83	20 45	18 88	15·34	19·19	18 000	16·88	15·809	14·79	13 816	12·90	11·19	8 21	6 47	5·35	4·55	3 96	3·50	3·15	2·86	25
26	81·68	530·93	24·69	22·12	20 42	16 59	20·77	19 469	18·26	17 099	16·00	14·943	13·97	12 10	8·88	7·01	5·77	4·93	4·29	3·79	3·40	3·08	26
27	84·82	572·56	26·63	23·86	22·02	17·89	22·40	20·996	19·59	18 440	17·25	16 115	15·06	13·05	9 58	7·56	6 22	5 31	4 63	4 09	3 67	3·32	27
28	87·97	615·75	28 64	25 66	23 68	19 24	24·03	22 580	21·17	19 831	18·55	17 330	16 20	14 03	10 30	8 13	6·69	5·71	4·98	4·40	3·94	3·58	28
29	91·11	660·52	30·72	27·52	25·40	20·64	25·84	24·221	22·71	21·273	19·90	18·590	17 38	15·05	11 05	8·72	7 18	6 13	5 34	4 72	4 23	3·84	29
30	94·25	706·86	32·87	29 45	27·19	22·09	27 64	25·921	24·30	22·765	21 30	19·895	18 62	16·12	11·81	9·31	7·70	6 56	5·70	5·05	4·53	4·11	30
32·5	102 10	829·58	38·59	34·57	31·91	25·92	32·46	30 421	28·53	26 718	24·99	23 349	21 83	18 90	13 87	10 95	9·02	7·70	6·71	5·93	5·31	4·82	32·5
35	109·96	962 11	44·74	40 09	37 00	30·07	37·62	35·281	33·09	30 986	28·99	27·079	25 28	21 94	16·09	12·68	10 48	8·92	7·76	6·88	6·17	5·69	35
37·5	117 80	1104 47	51·37	46·02	42 48	34·51	43·21	40·501	37·98	35 571	33·28	31 086	29 06	25 16	18 47	14 58	12·01	10 25	8·93	7·89	7·07	6·41	37·5
40	125 66	1256 64	58·44	52·36	48 33	39·27	48·13	46·081	43·20	40·471	37 86	35·368	33 02	28·65	21 00	16 56	13·69	11 65	10·14	8·98	8·05	7·31	40
42·5	133·52	1413 06	65·72	58·88	54·35	44·16	55·28	51·817	48·59	45·509	42·57	39·771	37·18	32 20	23·63	18·65	15·36	13·11	11·43	10 10	9·05	8·21	42·5
45	141 37	1590 43	73 97	66·27	61·17	49·70	62 10	58·322	54 69	51 222	48·24	44·703	41 80	36 26	26 58	20 95	17 32	14·75	12·83	11·37	10·19	9·25	45
47·5	149·24	1772 65	82·42	73 84	68·16	55 38	69 33	64·982	60 94	57·071	53·39	49·875	46 62	40 37	29 64	23·39	19·26	16 45	14 33	12 67	11·35	10·29	47·5
50	157 08	1963 50	91·32	81·81	75·52	61 36	76 77	72 002	67·52	63·257	59·16	55·263	51·60	44·77	32 81	25 87	21 39	18·21	15·84	14 04	12·58	11·42	50
52·5	164 91	2164 73	100·69	90·20	83·29	67·65	84·69	79 382	74 44	69 718	65·22	60·927	56·95	49·32	36 21	28 58	23·53	20·09	17·51	15 47	13·86	12 57	52·5
55	172 79	2375 83	110 50	99·00	91·38	74·24	92·90	87·122	81 70	76 516	71·58	66 868	62 44	54·17	39·71	31 30	25 88	22·03	19·17	16·99	15·23	13·82	55
57·5	180 64	2596 72	120·78	108 20	99·87	81·15	101·59	95·223	89·30	83 630	78·24	73 087	68·32	59·16	43 43	34·28	28·23	24·10	21·01	18 56	16·63	15·08	57·5
60	188 50	2827 43	131 50	117 81	108·75	88·36	110 56	103·683	97·20	91 061	85·19	79 379	74·31	64·47	47·25	37·25	30 80	26·22	22 82	20·22	18·12	16·45	60
65	204 20	3318 31	154 34	138·26	127·63	103 70	129 82	121 684	114·11	106 870	99 98	93 395	87·30	75·61	55·50	43 81	36 07	30 80	26 84	23·72	21 25	19·27	65
70	219 91	3848 45	178 99	160 35	148·02	120·26	150 49	141 124	132 36	123·944	115 95	108 316	101 14	87·74	64·31	50 70	41·92	35·69	31 05	27·52	24 66	22·39	70
75	235 6	4417 86	205 48	184·08	169·91	138·06	172·84	162 004	151·92	142·282	133·11	124 342	116·23	100 66	73·89	58·32	48·02	41 00	35 74	31·58	28 29	25·66	75
80	251·33	5026 55	233 79	209 43	193·32	157·07	196 55	184 325	172 80	161 886	151·29	141 473	132·20	114·10	83 94	66 35	54·69	46 24	40 21	35 69	32 17	29·15	80
85	267 04	5674 50	263 93	236 44	218·25	177·33	222·91	205·388	195 13	182 754	170 97	159·710	149·29	129·20	94 91	74 91	61·68	52·06	45·40	40 56	36·33	32·95	85
90	282 74	6361 73	295 89	265·07	244 68	198 80	248 76	233·287	218·79	204 887	191 48	179·052	167·31	144·41	106 23	83 97	68 70	58 33	50 89	45·17	40 71	36·90	90
95	298·45	7088·22	329 68	295 34	272·62	221·51	277·22	259·927	243·75	228·284	213·56	199·500	186·48	161·50	118·55	93 57	77·05	65 78	57 34	50 66	45 58	41 16	95
100	314·16	7853·98	365·30	327·25	302·97	245·43	307·11	288·008	270 08	252·946	236·40	221·032	206·56	178·92	131·16	103 67	84 82	72·26	62·83	55·76	50·27	45·55	100

*From *Jour.* Chem. Met. & Min. Soc., South Africa.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that candid criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Soluble Gold Slime

The Editor:

Sir—In an earlier number of the *Mining and Scientific Press*, J. D. Hubbard, in commenting on zinc-box practice at Taracol, Korea, affirms that gold in the boxes is precipitated in an allotropic form and so rendered insoluble in a cyanide solution. From the appended data which I gathered while with the King of Arizona Co., it would seem that such a state of solution should be attributed to some local occurrence rather than considered a universal condition or property of the solution. No attempt was made to obtain the exact rate at which the gold dissolved. It is to be noted, however, that nearly one-half of the total amount was dissolved and removed in the first solution charge. The slow solvent action at the close may in some measure be ascribed to occlusion of the fine gold particles in a gray flocculent residual precipitate, presumably originating from base metals in the slime, and which became lighter in color with each successive decantation of solution. In carrying out the experiments, series I, 0.20 gm. of gold slime was covered in a bottle with 300 c.c. of the solvent and occasionally agitated, then settled and at the close of the stated treatment period, decanted through four filter papers and the filtrate assayed. The heavy slime remaining practically undisturbed on the bottom was then covered with the second solution charge. The daily working solutions taken from the sump were used in the tests. While time and facilities available did not permit of exhaustive experiments, there were no exceptions to the conclusion that gold precipitate is to some considerable extent soluble in cyanide solution.

SERIES I

Chg. No.	Treatment. Hours.	Sol. titration. Lb. KCN, ton. Before.	After.	Sol. assays. Mg., ton. Before.	Mg., chg. After.	Assay. Residue. Mg. Tot'l.
1	24	3.0	1.9	0.002	13.2	..
2	24	4.1	..	0.005	8.5	..
3	24	3.9	3.4	0.005	4.1	..
4	24	4.4	4.1	0.004	1.1	..
5	24	4.0	..	0.002	0.1	..
6	24	5.0	..	0.004	0.1	1.5

J. E. CLARK.

Polaris, Arizona, August 10.

Device to Free Air-Line of Water

The Editor:

Sir—I noted with interest the letter and sketch by A. L. Lamb, in your issue of September 3. Your readers may not perhaps be aware that on permanent air-pipe lines, the use of a regular water-trap is quite customary. It is considered good practice to place an air-receiver as close to the compressor, and a water-trap or separator at a low point in the main as near the drills, coal mining machines, or quarry machines, as possible. As stated in Mr Lamb's letter, the water condensation, which at this point in the line, should reach its largest quantity, as the air will be coolest here, may be collected to the best advantage and drawn off, leaving the air dry and rendering freezing at the drill exhausts unlikely. Further, if an air re-heater can be used as is customary on surface work, the efficiency of the air power will reach its highest possible point. One maker of mining machinery manufactures a standard water-trap and separator for this purpose.

S. B. KING.

Chicago, September 10.

A Hasty Conclusion

The Editor:

Sir: Your card received, informing me that your edition of July 23 contained something of interest to me. Your reckoning is correct. I overlooked a date, thence the error, one you could have corrected in a dignified way with less labor.

You published a private letter without the consent of the writer thereof, and violated a course of conduct which some publishers hold as honorable. Your performance has two aspects—evidently you were much in need of something to print; and you took the opportunity for a covert attack upon the State Mineralogist. Concerning that implied in ending your article, I will state that I am expert in handling metals, in putting into marketable form the gold and platinum contained in concentrates. I venture that you do not know one professional M. E. who can make such claim and verify it, and I am nearly certain that the person who produced your article would be outclassed in such work, whether he be or be not a somebody.

WILLIAM GREGG.

Grass Valley, September 7.

[Mr. Gregg will be remembered as the man who made a trip to Smartsville to purchase a mine on the strength of an old item of news re-published in our Anniversary Number, and somewhat hastily criticized us to others for publishing 'fake' news.—EDITOR.]

A Cyanide Problem

The Editor:

Sir—I note with interest the letter of 'Metallurgical Engineer' in your issue of August 27, commenting on the request of 'Mine Owner' for a method of dealing with antimonial ores by means of the cyanide process. 'Metallurgical Engineer' believes that it would be foolish for one in possession of the required information to make it public gratis, as such knowledge is the capital of him who has it. The standpoint is natural, and it is easy to understand its acceptance by the great majority of people. This is doubtless the reason why the columns of the technical press rarely give notice of the details of a really important new idea, and it is also the reason why the records of the patent office are so clogged with applications for patents on inventions that are considered important by their fond originators. The idea, however, seems to me rather near sighted. It

is true that the mine owner may be required to pay a high price for his information originally, but if mine owner's neighbor, having the same kind of ore to treat, requires that information, the chances are that he will get it by watching operations. Valuable information of that sort is bound to spread in one way or another, and it is futile to try to prevent it. On the other hand, if this information were published freely it is more than likely that it would require a trained metallurgist to apply it, and the man with the knowledge would get his job after all. There need be little fear that such information would be appropriated and used by novices. It requires a scientific mind and scientific training to apply scientific truths, and while the metallurgist is not protected by statute, he is amply guarded by the law of human capability. No one who has read the pleas of T. A. Rickard for the free publication of technical information can pass the matter by without thought. And the more thought given to the subject, the more clear it will appear that the one who gives this information is little likely to suffer by it. There is, however, a more important reason why 'Mine Owner' cannot receive an answer to his question in the columns of the press, and that is that his information is too meagre. Some ores containing antimony are easily treated with cyanide and others not so easily. It depends not only on the amount of antimony, but its condition and combination with other elements, so much so that it would require a whole book to include all the possible occurrences of the element in ores.

H. A. Megraw.

San Luis de la Paz, Gto., Mexico, September 2.

Decrease of Value in Ore-Shoots with Depth

The Editor:

Sir—In reference to O. H. Hershey's article on the 'Decrease of Value in Ore-Shoots with Depth,' in your issue of July 16, it may be suggested that while it is a well known fact that on the whole, the deeper we get, the lower the grade of ore, to attempt to cover the matter in a few words would be futile. Mr. Hershey's article is well amplified in that on the 'Economics of Secondary Enrichment,' by A. M. Finlayson, in the same number of the *Mining and Scientific Press*. That all mines decrease in value with depth is not always correct: for example, in 1890, when I left the Gogebic range, I believe that the prevailing idea of economic geologists was that most of the iron would be found above the 1000-ft. level. I was told only yesterday by a gentleman coming from that district that the Montreal mine had got a large body of hematite running over 68%, with hardly any phosphorus in it, at a depth of 1900 ft. In addition to this the Newport and Pabst, toward the eastern end of the range, show ore some 800 ft. wide at a depth, so I believe, below 2000 ft. A few miles away there is no doubt that at a depth of 5000 ft. the mines in the Lake Superior copper country have grown poorer in depth, the most noticeable decrease being in the Calumet & Hecla, as shown by the last report. I think a broad principle can be stated that the deeper one gets the poorer the ore becomes, though this is modified in a great many cases by the effects of secondary enrichment.

The whole subject has been studied by S. F. Emmons, W. H. Weed, C. R. Van Hise, and others, and there is much in the literature on the subject. An abstract of the conclusions of these men might be of service to the profession.

J. Parke Channing.

New York, August 23.

Cyaniding Sulphides

The Editor:

Sir—One of your recent correspondents asks for information on cyaniding concentrate. Following is a list of articles in which the subject is mentioned, which may interest him: *Bulletin* Amer. Inst. Min. Eng., S. F. Shaw; *Mining World*, June 1, 1907, Frank C. Smith; *Eng. & Min. Jour.*, April 3, 1909, Walter Brodie; *Journal* Chamber of Mines Western Australia, May, 1908, B. L. Gardiner; *Mining and Scientific Press*, October 3, 1908, A. E. Drucker; *Mining and Scientific Press*, September 26, 1908, F. C. Brown; *Eng. & Min. Jour.*, April 17, 1909, E. Walsh; *Mining and Scientific Press*, October 2, 1909, J. D. Hubbard; *Mining World*, November 27, 1909, Etienne A. Ritter; *Mining and Scientific Press*, March 19, 1910, A. E. Drucker; *Mining and Scientific Press*, April 30, 1910, A. E. Drucker; *Pacific Miner*, A. C. McIntire. Besides the above there are a great many short notes and quotations that give valuable information. If I were sure that I have correctly guessed the identity of your correspondent, I would dare suggest that there are just ten mining journals which should be considered indispensable on a big milling and cyaniding plant. One manager subscribes for nineteen such publications and says it is the best investment he has made. He has a list of sums saved which he credits to what the shiftmen have read in the little library, and if something substantial is not added every week he starts an investigation.

Mark R. Lamb.

Milwaukee, Wisconsin, August 29.

The Government cement mill at Roosevelt, Arizona, completed the grinding of the last pound of clinker about the first of June, and will probably be dismantled at once. It has been in operation nearly five years, and has produced 330,000 bbl. of cement, most of which has been furnished to the contractor building the Roosevelt dam. The remainder has been used in the power-house, canals, flumes, and auxiliary structures. The mill was built on account of the high cost of transporting cement to the site, which is quite inaccessible. The Government engineers estimate that the mill has saved about $650,000.

The Tieton project of the United States Reclamation Service, in the State of Washington, includes about 30,000 acres of land which will receive water from the Tieton river through a main canal about 12 miles long. In the construction of this canal concrete lining cast in sections was used instead of the usual lining poured in place.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

Since the use of reinforced concrete has become quite general in building construction the demand for some substance that will make it water-proof has arisen, and many firms now have placed such compounds on the market. Some of these are mixed directly with the concrete, while others are applied as a coating to the surface.

Organic matter in old 'tailing' if abundant, interferes with cyanidation by acting as a reducing agent and so decreasing the amount of oxygen available for the reactions. If the material is sufficiently valuable to warrant roasting the organic matter can be eliminated in that way. Usually, however, this is out of the question. It frequently happens that spreading the tailing out in the sunshine, with repeated plowing and harrowing, will cause enough of the vegetal material to oxidize, to permit of cyanidation. This plan is worth trying, though it will not, of course, accomplish much where carbon in the form of graphite or even wood is abundant. Wood fortunately does not interfere with reactions and is only troublesome to the extent that it clogs pipes and classifiers.

Coal briquettes were produced in the United States last year in greater quantity than ever before, according to the U. S. Geological Survey, but the output is still insignificant compared with the 18,000,000 tons made annually in Germany. The American product in 1909 is reported as 139,661 short tons, valued at about $453,000. This is an increase of 54% over the production of 1908. The reason for the much greater production in Germany is stated to be the cheapness of labor there, the greater cost of coal, and the practice of coking coal in retort ovens which yield a large quantity of pitch suitable for use as a binding material for briquettes. The Geological Survey states that here the briquette industry is held back by the large supply of cheap natural fuel, by the high cost of labor, and by attempts to exploit secret processes for which extravagant claims are made but which have failed to make good.

Qualitative determination of copper in cyanide solution is as follows: Take 100 c.c. of the cyanide solution, heat to boiling, and add 10 c.c. HCl. After a few moments add 0.5 gm. $KClO_3$, boil until most of the chlorous gases are expelled, and add 10 c.c. ammonia. The solution will be colored blue if copper is present. Clennel gives this method for the quantitative determination, but with this addition: after adding the ammonia, boil, cool, dilute to 50 or 100 c.c., according to the density of the color, and filter into a Nessler tube. The tint of the liquid is then compared with that of a series of standards made by adding measured quantities of copper solutions (1 c.c. = 1 mg. copper) to 5 c.c. strong ammonia and diluting to 50 or 100 c.c. In an ordinary case the amount of copper will be from 5 to 15 mg. and a series of standards may be prepared differing by one milligram.

The size of culverts through railway embankments which is required by law was stated some years ago by the Arkansas Supreme Court in a case that has since been an important precedent in that part of the country. Recently this decision has been reaffirmed by the court in the case of the St. Louis Southwestern Railway Co. v. Mackey, 129 S.W. Rep. 78, as follows: "It is the duty of a railroad company to provide proper and sufficient openings or culverts for the escape of the water of all streams crossing its roadbed, so as not to flood the land of other riparian owners, whether at ordinary stage of water or during floods which could reasonably have been foreseen and guarded against; and if it fails to provide such openings it is liable to any person damaged thereby." In the recent decision it is pointed out that if a flood is of such overwhelming and destructive character as to produce injury by its own force, independently of any other real efficient cause, the railroad company is not liable. But if the injury is produced by the combined effect of a flood and the concurring negligence of the railroad, then the latter is liable for it. This is because it is an established legal principle that where two concurring causes produce an injury, which would not have resulted in the absence of either, the party responsible for either cause is liable for the consequent injury, and this rule applies where one of the causes is "an act of God," such as an unprecedented flood.

The re-located line of the Panama railroad is 46.2 miles long, or about 1 mile shorter than the old line. From Colon to Mindi, 4.17 miles, and from Corozal to Panama, 2.83 miles, the old location is used, but the remaining 36 miles are new road. From Mindi to Gatun, the railroad runs in general parallel to the canal, and the maximum grade of the line, 1¼%, is in this stretch, where the ascent from nearly mean sea-level to 95 ft. above is made. At Gatun the road leaves the vicinity of the canal and runs east along the valley of the Gatun river to a point about 4½ miles from the centre line of the canal, where it turns southward again, and skirts the east shore of Gatun lake to the beginning of Culebra cut, at Bas Obispo. In this section there are several large fills, and the maximum elevation of the line is reached, 110 ft. above mean sea-level. Through Culebra cut, the road will run on a berm on the east side, 10 ft. above the surface of the water. From the south end of Culebra cut, at Paraiso, it will run practically parallel with the canal to Panama. The maximum grade between Gatun and Panama is 0.45%, and the maximum curvature is 6°. Where the railroad crosses the Gatun river, a bascule steel bridge is to be erected, and a steel girder bridge ¼ mile long with a 200-ft. truss channel span, is in use across the Chagres river at Gamboa. Smaller streams are crossed on concrete culverts. Near Miraflores, a tunnel 736 ft. long has been driven through a hill. The cost of the new line is estimated at $7,225,000.

Special Correspondence

KALGOORLIE, WESTERN AUSTRALIA

Increased Mill Capacity. — South Kalgoorlie Sinking. — Output.

A good deal of construction work is still under way in our mills, all tending toward an increased tonnage to meet the decrease in value of the ore. A No. 7½ Gates breaker has just arrived for the Associated. It is proposed to install skips in the main shaft, when ore-bins have been cut out at certain levels in the mine, and these will be emptied direct into the new crusher, and from this to the mill-bins. The Great Boulder company is installing two new Babcock & Wilcox boilers, while other additions to the mill are about complete. The erection of a 1000-kw. exhaust turbo-generator is now being hurried at the Horseshoe. It is rumored that the Lake View & Star company is to add 25 stamps and grinding plant to its existing 75 head. The tramway to the recently amalgamated Star leases is now being laid for the conveyance of ore to the Lake View mill. At the Perseverance, the new mill is

Fire at Perseverance Mill October 19, 1909. The New Mill is Now Ready.

finished, and the furnaces are being heated up. The new drum shaft for the main shaft hoist is in position, and the engine is being rapidly put together again. The Perseverance plant now embodies 10 Heine safety boilers for the Austral Otis (Melbourne) hoist, and two 30-drill Walker air-compressors and condensing plant; electrically-driven jaw and Gates type breakers, belt conveyors, eight No. 8 Krupp ball-mills, conveyors, elevators, six Edwards duplex furnaces, grinding pans and tube-mills, agitators, and filter-presses. The new portion of the mill seems to be almost perfection. At the Hannans Star, a vacuum slime-plant is well on toward completion. This will be about the same capacity as that on the Lake View Consols, namely, 9000 to 10,000 tons per month. There is a big heap of old residue in the dump, and it will take all of two years to treat it. Some of it should be of fair value, as a great deal of custom work was done in the old mill, large amounts of it being rich. The old mill consisted of two No. 5 Krupp mills dry crushing, mixing with KCN, rough classification, tube-milling the coarse product, agitation of the slime with BrCN, and filter-pressing. Like the Lake View and Oroya Links dumps from similar treatment, it is probable that the vacuum treatment results will not be higher than 60 to 70 per cent.

The South Kalgurli is sinking to 1800 ft., and then will go a further 200 ft. The old residue dump on this mine, that used to make such a dust in summer, is now being used by the Perseverance for filling stopes. The Kalgurli, in its cross-cut at 1550 ft. has passed through 25 ft. of ore worth $25 per ton, and it seems that the diamond-drill results will be proved by this cross-cut. Recently some telluride of copper was found in the Kalgurli mine, and Mr. Patton, the chemist, is to prepare a paper on its occurrance, along with other tellurides, for the local branch of the Aus. Inst. Min. Eng. Complete analyses have not been made yet, but it is thought that it is not exactly of the same composition as rickardite, the copper telluride from Cripple Creek. Kalgoorlite has been found in fair quantities in this mine.

The Commission on Miners' Phthisis is taking evidence in Kalgoorlie, both underground and mill conditions and employees being examined.

Returns from the principal mines are as follows:

Name.	Tonnage.	Value.	Profit.	Dividend.
Associated	11,010	$71,000	$ 8,000†	$ .....
Asso. Northern Blocks	2,040	25,000	14,000	.....
Chaffers	4,000	32,000	2,500	.....
Golden Horseshoe	24,996	164,000	2,900†	.....
Golden Ridge	2,331	31,000	14,000	34,500
Great Boulder Proprietary	18,556	244,000	143,000	328,000
Great Fingall	10,517	77,000	11,400	.....
Hainault	5,971	40,000	5,000	.....
Ivanhoe	19,395	204,500	100,000	.....
Kalgurli	10,780	140,000	73,000	.....
Lake View and Star	11,236	67,000	16,500†	.....
Lake View Consols	10,400*	8,400	2,300	.....
Oroya-Brownhill	20,747*	26,000	13,500	.....
Oroya-Black Range	4,690	47,000	12,500	50,000
Oroya-Links	11,044	78,000	18,000	.....
Sons of Gwalia	13,511	118,000	50,500	105,000
Sons of Gwalia South	2,472	24,000	7,500	.....
South Kalgurli	9,260	62,500	14,000	.....

*Treatment of dumps. †Loss due to heavy capital expenditure.

MEXICO

Pacific Smelting & Mining Co. — Sonora Copper Smelter Co. — Nueva Luz Cross-Cutting to Mother Lode.

The Pacific Smelting & Mining Co., its affairs readjusted, ample capital available, and under new management, is preparing to assume an important position in the mining industry of the west coast portion of Mexico. The present officers are Melbert B. Cary, president; George M. Ryall, vice-president; and Courtenay De Kalb, general manager. The company owns, through the Compañia Metalurgica y Refinadora del Pacifico, a subsidiary organization, the 350-ton smelting plant at Fundicion, State of Sonora, on the Southern Pacific Railroad of Mexico, and this plant is to be operated as a custom smelter, on broad-gauge lines and with a view to an important part in the development of the rich mineral territory tributary to it. Fundicion is 141 kilometres south of Guaymas, 173 kilometres north of San Blas, the junction of the Southern Pacific and Kansas City, Mexico & Orient roads, and 392 kilometres north of Culiacan, the Sinaloa capital. It is midway between Corral and Navojoa, the junctions, respectively, of the Yaqui River line and the Alamos branch of the Southern Pacific. The company also owns, through the Anita Copper Mines Co., the Yaqui Mining Co., and other subsidiary organizations, a number of valuable mines in the State of Sonora, and while it is planned to make these mines regular contributors to the smelter, the building up of a big custom business will receive particular attention. The ores of the El Cobre mines of the Anita Copper Mines Co., 25 miles northeast of Fundicion, are highly silicious, and it was

originally planned to make these mines the chief sources of supply for the smelter. This meant the heavy penalizing of siliceous custom ores in a district where at present the available ores are largely siliceous and consequently these plans have not dropped to the new management. It is held that the siliceous El Cubo ores will be of much greater value to the Fundicion plant in the future when the tributary territory begins to offer basic ores. Traction engine trains purchased by the former management to haul El Cubo ores are to be sold on the ground that existing grades and rainy seasons preclude satisfactory operation and eventually a narrow gauge railroad will be built to connect the mines and Fundicion.

The Fundicion smelter is the centre of a small town. There is a two-story hotel, a school, 20 American style cottages and many dwellings for Mexican workmen. In order to conform to the provisions of the State concession, the plant was blown in during May 1908 and operated 15 days. No ore has been smelted since that time but periodically the boilers have been fired and the machinery operated with the object of keeping the equipment in good shape. The concession under which the smelter was built exempts the plant from all State and municipal taxes for a period of 12 years from June 1, 1908, and it is estimated that the saving by the exemption will amount to over 4% on the gross value of the output. There is at present at the smelter ore to the amount of 1000 tons, having a value of $112,000 and fully 2500 tons of coke. The smelter and other property of the company at Fundicion represent an investment of approximately $150,000.

George M. Ryall, vice-president of the Pacific Smelting & Mining Co., is the man who several years ago secured the big Ryall exploration concession in the Yaqui River region of Sonora. He organized the Yaqui Mining Co. to denounce and develop mineral ground within the boundaries of the concession, and this concern was merged with the Pacific Smelting & Mining Co. A total of 2700 pertenencias, or 6669 acres, was taken up before the expiration of the concession last spring, and several very promising properties will now be extensively developed. The General Development Co., a Lewisohn concern, is pushing the development of Ryall concession properties held under an option to purchase for $100,000.

The Sonora Copper Smelting Co., a Kansas City concern with a capital of $2,000,000, expects to have a 100-ton smelter in operation in the Magdalena district of Sonora early in 1911. The equipment is on the ground and work is in progress at the smelter site. The mines are three miles from Noria, a station on the Sonora railway, and development has been in progress three years. The proved ore is estimated at over 300,000 tons. A wire-rope tramway will carry the ores from the main traction adit to the smelter bins, 3500 ft. distant and 450 ft. below, and this tramway will be built to handle 500 tons per day in anticipation of the early increase of the smelter to that capacity. The company has secured from the Sonora government a concession exempting the plant from State taxes for twenty years, and providing against the granting of similar exemptions to other smelters in the Magdalena district during that time. A. M. Conrad, who located the mines in December 1906, is president and general manager of the company.

French capital, which of late is showing an inclination to become prominently identified with the mining industry of Mexico, may have an important part in the Oro Grande project for the re-opening of the famous old producers of the La Luz camp of Guanajuato. Representatives of the Oro Grande Mines Co. have been in France for some time, and French engineers are now on the way to Guanajuato to make examinations. On their report will depend the investment of much French money in the enterprice. The company has a capital of $9,750,000, of which $2,750,000 is preferred and $7,000,000 common. At the reduction plant of the Guanajuato Amalgamated, taken over with the mines of that concern several months ago, the Oro Grande company is now treating 300 tons per day, a part of which is ore from the dumps of the old La Luz mines. A profit of from ₱1,000 to ₱20,000 per month is being earned and this is being applied to wiping out an indebtedness of ₱211,000 assumed at the time of the amalgamated deal. This deal was largely a stock transaction. The old producers of La Luz and the adjacent ground that the company holds represent a cost of about ₱1,000,000. The Amalgamated plant is to be increased by additional tube mills and later, if the plans are carried out, a big plant will be built at a more convenient location.

Now that the Nueva Luz crosscut designed to intersect the mother lode of Guanajuato at depth, is in progress, mining men of the district are speculating on the result in the event no pay ore is found. It is agreed that if the ore is found to continue to depth it will mean new life for the district, but opinions differ as to the effect in the event the Nueva Luz development proves that Guanajuato is not a deep camp. The crosscut is being driven from the 600-metre level of the Nueva Luz shaft, and it will strike the Veta Madre 500 ft. below the deepest antigua working. The Mineral Development Co. has collected from the Federal Government a subsidy of ₱15,000 for the 100 metres of the shaft below the 500-metre level. The Guanajuato Reduction & Mines Co. is now treating from 20,000 to 22,000 tons of dump ore and mine fillings per month. Good profits are being earned. A parallel vein that greatly increases the value of the Carmen property has been cut on two levels by the Carmen-Guanajuato Gold Mining Co. The vein averages 25 ft. of good milling ore.

The reduction plant of the Virginia & Mexico Co., the first modern plant built in the Hostotipaquillo district of Jalisco, is idle pending new development. The manganese ores now available are extremely hard to treat, and a satisfactory extraction appears doubtful. With depth it is expected to secure less rebellious ores. The Espada Mines Co., formerly known as the Vick Mining & Milling Co., which is developing the old Espada, Deseada, and San José mines and adjacent virgin ground in the Hostotipaquillo district, has arranged to mill at the Virginia & Mexico plant. An aerial tramway will be built, and deliveries will be started about March of next year. In the last five months the Consolidated Mining Co. has shipped ₱70,000 worth of ore from the Casados mines in the Hostotipaquillo district. This ore was taken out in development work. Equipment for the proposed reduction plant is being assembled. The initial capacity will be about 150 tons per day.

SALT LAKE, UTAH

International Smelting & Refining Co.—Utah Metals Co.—Alta Hecla-South Columbus Consolidation.

The Tooele plant of the International Smelting & Refining Co. now has four of its five reverberatory furnaces in operation, although not at full capacity. This will be the normal operating equipment, it being the intention to hold one furnace in reserve. The capacity of the furnaces is 300 tons each, but they are not treating much over half that amount at present. The South Utah started its mill the first of the month, and this will give the plant at Tooele a fine concentrate high in iron and sulphur. Small quantities of ore from other mines are also being shipped in so that by the time the plant is ready to operate at full capacity there should be little trouble in keeping it supplied.

A group of Boston capitalists who are interested in the Utah Metals Co. have made an inspection of the property and have expressed themselves as pleased with the progress which is being made. Few people, even hereabouts, realize that this is one of the most important mining projects of this great camp. The tunnel will be 11,000 ft. long starting from a point near the Utah Consolidated in Bingham and terminating in Middle canyon, Tooele, at a point about five miles from the International smelter, and well above it, so that an aerial tram would afford easy transportation and give a considerable excess power. This gives a route of seven miles for the transportation of Bingham ores to the new smelter against a railway haul of nearly

fifty. The tunnel develops a flow of water which is reckoned on for at least 500 hp., and water rights in the canyon supply a sufficient amount for all work in connection with the driving of the tunnel. The company owns about 3500 acres of ground in the proved mineral district of Bingham, and all over its undeveloped ground are prospect holes, many of them showing ore or good indications. The work has already opened some good looking territory, but active development through the tunnel will not be attempted until it is driven about 2000 ft. farther, when it will be under some known bodies of lead-silver ore at a depth 900 ft. below the present workings. The tunnel is now in something over 4000 ft. and should be at the half-way point by the end of the year. Meantime at Park City the Snake Creek tunnel is going ahead at the rate of 12 ft. per day. Work was begun the middle of May, but only 1200 ft. has been driven to date, owing to the fact that the equipment has not been fully installed. Pipe for ventilation is now at hand and a gasoline locomotive for the haulage so that there should be no further delay in the work.

Notwithstanding the violent opposition of a minority of the stockholders of the South Columbus both this company and the Alta Hecla voted in favor of the consolidation of the two companies. At the South Columbus meeting over 350,000 shares of about 400,000 present voted for the consolidation. There is no doubt that the two companies can be worked to better advantage as one, but the South Columbus minority maintained that the basis of consolidation was unfair to their company. The discovery of gold in the Deep Creek country is causing some interest. This country is known to have large deposits of lead and copper, but the latest is that two good sized veins of gold ore running well above $100 per ton have been opened up. The Deep Creek region is one of great possibilities and such a discovery is not surprising. Announcement is also made that two of the mines of this district will be opened for the production of a gold and bismuth ore. The bismuth is especially desirable, as it is expected that the demand for it will increase for use in storage batteries, bismuth being an essential feature of the new battery which Edison is putting on the market. The Westrich Drill Co. has been organized in this city for the manufacture of a hammer-drill.

GOLDFIELD, NEVADA

Goldfield Consolidated.—Combination Fraction.—Florence. — Nevada Eagle.—Atlanta.

A continued shortage of water caused a material reduction in the output of the Goldfield Consolidated Mines Co., following the period in which repairs were being made to the mill, until the month of August, when the plant resumed treating nearly its full capacity of 900 tons per day. This obstacle to operations on a full scale has now been removed, some rain having fallen to replenish the depleted supply from springs and the company having laid pipelines from some of the deeper abandoned shafts on its territory, which will in the future insure an ample supply at all times. Under ordinary circumstances the Consolidated is enabled to obtain an ample water supply from the water company which furnishes the town of Goldfield and the mills of the district, this water being piped from Magruder mountain near Lida, thirty-five miles from Goldfield, but there was little snow in the mountain country last winter and until recently rain had not fallen in the desert for five months. New construction at and near the mill is practically completed and all new buildings are absolutely fireproof and sufficiently removed from the main structure to insure against the spread of fire and are equipped with the most approved fire-protection devices. At Jumbotown and at a point nearly equadistant from the Clermont, Mohawk, and Red Top shafts, are being erected the storage battery plant, with a capacity of 2500 hp., the central transformer house, electrical machine and supply house, and the assay laboratory. The structural work on these buildings, all of which are steel and concrete, is nearly completed. This construction should be finished in October, when some important economies in operation will be effected, the recent large items for construction will be eliminated, and the company's profits will be correspondingly enhanced. The August record for the advance of new development, 3297 ft., affords an indication of the large amount of this character of work in progress and the results are attested to by the average gold content of ore from new headings, 2.14 oz. per ton, a grade considerably higher than the average treated in the mill. One of the most notable of recent developments has been the opening of the big vein on the Combination, first developed by the Hampton stope, on the bottom level a depth of 480 and 100 ft. below the sill-floors of that stope, which has yielded a vast tonnage of rich ore above the fourth level, for a width of over 100 ft. at one point and 300 ft. in length. The tonnage from the Clermont has been increased of late and is now nearly equal in volume to that taken from the Mohawk. An improvement is reported in the character of new headings in the Laguna, where good mill ore has been taken from the 600-ft. level for the past two months. This point in the vein is 230 ft. vertically below the deepest of the Red Top workings, and as the vein is more than usually flat here a large area of stoping ground will be afforded in this orebody. Development at a point between the Mohawk and Red Top main workings, including the Gold Wedge fraction, formerly the property of the Jumbo Extension company, has proved highly successful. This orebody was first penetrated on the 450-ft. level, but proving to be erratic in character an intermediate cross-cut was driven to the vein, and on this level the stopes now being opened give promise of a heavy production and the quality of the ore exposed is excellent. With the exception of seams of high grade the best average of ore from new workings has been that of the product of newly opened territory, at a depth of 180 ft., on the Combination. In August 285 tons of ore taken from this drift returned an average of $119 per ton. The Red Top maintains its usual production and the grade of the product, always more uniform in value than that from the other mines, has been second only to the Clermont ore.

Preparations are now being made by the manager of the Combination Fraction to increase the daily output, treated at the Nevada Goldfield mill, to 100 tons. The plant has been successfully treating 50 tons per day, but the water famine has prevented a larger production by this company. The installation of an ore classifier and improved equipment in the cyanide department has materially enhanced the efficiency of the plant and the manager declares it is now in condition to treat, at a low cost, all the ore that can be produced readily under present conditions. No official report has been issued by this company for some time past, but its financial affairs are said to be in good shape. The mine has a large tonnage of excellent mill-ore exposed on the 500-ft. level, and development on the other orebody to the south and west has been attended by good results between the 280 and 350-ft. levels.

The Florence Goldfield maintains a production of 140 tons per day and mill-heads have advanced recently owing to the supply of ore of better grade coming from the 350-ft. level to the north and near the old Reilly lease. The vein opened in exploring this ground is being developed to the south and a stope has been opened for over 200 ft. in material of excellent grade and contains seams of high-grade ore. At this point the vein has not been worked above the 350-ft. level, and it promises to yield a large tonnage for a distance of several hundred feet in length. The main shaft of the Florence has been enlarged to two compartments and man-way by raising from the 500-ft. level to within 100 ft. of the surface. This work has proceeded rather slowly owing to the necessity for hoisting ore through this shaft, the capacity of the aerial tramway from the Little-Florence shaft being insufficient to supply the mill, though a considerable volume is being brought from the Little-Florence and Rogers lease territory. With the completion of the main shaft the known orebodies will at once be opened on the 500-ft. level and the shaft will be sunk without delay to a depth of 1000 ft. A shipment of 50 tons of ore assaying $40 to $55 per ton has been sent to

the sampler from the Nevada Eagle mine four miles west of the town. The ore was taken from a raise above the 250 ft. level, where a vein of good proportions is exposed and the miners are breaking about 20 in. of material that will return a profit from shipping. A mile north of the Eagle, driving is in progress on the 120 ft. level of the Nevada Victor. The several Atlanta lessees continue active development on levels down to the 750 ft. the deepest drift of the Precious Metals Co.'s lease. Two orebodies of excellent appearance and good proportions have been opened on the 400 ft. level of the Victor workings of the C. O. D. Consolidated and a drift is nearing the same vein on the 500 ft. level.

BUTTE, MONTANA

Butte Suits. — Attorney General Visits Anaconda District.— Barnes-King.

The days of the old mining litigation have been revived by the institution of a suit against F. Augustus Heinze for $15,467, the suit being the outcome of a judgment for damages secured by Johnston T. Hagerty against the Hypocka Mining Co. for the loss of a leg while at work for Heinze's company. After the judgment was secured Hagerty was unable to have the same satisfied, so he applied to the court for the appointment of a receiver. The Hypocka Mining Co. was organized by Heinze during the days of the litigation with the Amalgamated Copper Co., and its property consisted in the ownership of the cage and some other property of the Minnie Healy mine. This property was afterward sold to Thomas F. Cole for the sum of $25,000. It is alleged in the complaint that the proceeds of this sale came into the possession of Mr. Heinze and that he has not accounted for the same, having, it is alleged, wrongfully appropriated them to his own use. It is also asked that an attorney fee of $5000 be allowed together with $1000 to pay the costs of the receivership. The suit brought by minority stockholders of the Parrot Copper Mining Co. looking to the appointment of appraisers for the purpose of valuing the property, has again been continued, this time until October 31. This suit, it will be remembered, was started by Boston holders of the stock shortly after the special meeting of the company at which it was voted by a majority of the holders of the stock to dispose of all interests to the Anaconda company under the merger terms.

The first round in the suit of the Anaconda Copper Mining Co. against the Butte-Ballaklava Copper Mining Co. is finished and the court has ruled against the Butte-Ballaklava people so far as relating to the application for a modification of the restraining order so as to make it reciprocal. In doing so the judge pointed out that the defendants had not made out a showing of ownership or trespass and the court therefore had nothing but counsel's verbal statement as to the conditions. This portion of the motion for a modification of the restraining order was continued indefinitely to allow the defendants an opportunity to make proof of ownership when it will again be argued before the court. The judge, however, did grant the Butte-Ballaklava company permission to enter the property in dispute and to timber where necessary. This was not objected to by the attorneys for the Anaconda company. In asking for the reciprocal order, the attorney for the Butte-Ballaklava company stated that the plaintiffs had penetrated into the Butte-Ballaklava mine through the High Ore workings for the purpose of inspecting the property. An impression has been created that the Butte-Ballaklava is closed down, which is entirely untrue. The only work stopped is in what is known as the disputed ground. A suit has been instituted against the Anaconda Copper Mining Co., the owners of the Butte Sampling Works, for $1568 which the Pony mining interests claim is due for ore shipped to the smelter sampler. The Pony owners claim that the ore shipped was valued approximately at $137 per ton and that when they received the smelter returns they were given less than $30 per ton for the ore. Therefore judgment is asked for $1568 which represents the difference between the sum which they received from the Anaconda company and the amount which they claim was the actual value of the ore.

G. W. Wickersham, U. S. Attorney General, with Frank Cole, his private secretary, Lyman Johnson, special Government prosecutor, Mr. Freeman, U. S. District Attorney, and others, made an examination of the Deer Lodge valley last week with the object in view of becoming acquainted with the conditions existing in regard to the alleged destruction of vegetation from the smoke and gases from the Washoe smelter. John D. Ryan, president of the Amalgamated Copper Co., C. F. Kelley, head counsel of the Anaconda company, together with R. L. Clinton, C. M. Sawyer, and N. J. Bielenberg, attorneys representing the Deer Lodge valley ranchers, were also in the party. The various points where the smoke and gases are alleged to have done the most damage were visited as was also the Washoe smelter. The attorney general and his party were taken through every part of the big smelter and shown every degree in the treatment of the copper ore from the time it arrives at the smelter until it is made into copper. A sapphire weighing 5¾ carats was recently turned out from the Yogo American Sapphire company's property in Fergus county of this State. It is pronounced the largest specimen ever found in America. The new mill of the Iron Mountain Tunnel Co. will be in operation about the middle of November. The manager says that when the mill is running the company will ship about 100 tons of concentrate per week. The Barnes-King mine is once more in operation and the company believes that it cannot only be worked sufficiently to bear all expenses of operating, but that there can be a profit realized besides. It was at first intended to lease the property, but Mr. Fischer and the officers of the company in New York, after consulting with mining men, decided to work the property on their own account. At the present time 25 men are employed and it is possible the force will be increased in the near future if present operations turn out satisfactorily. The new electrically-driven equipment of the Keating Gold Mining Co. is now in full operation and good work is being accomplished. A fine body of ore has been opened more than five feet wide and the assays run from $20 to $25 per ton. Two new stopes have been started. The ore will be shipped at the rate of a car per day. It is stated that there is sufficient ore in sight to make shipments at the rate of 35 to 40 cars per month.

LONDON

Burma Mines Co.—Penhalonga.—Dolcoath Report.

The Burma Mines Co. was formed in 1906 to acquire ancient lead-silver mines in upper Burma not far from the Chinese border. Bewick, Moreing & Co. are the managers, and H. C. Hoover is on the board. The mines had been worked by the Chinese presumably for silver only. The carbonates had been practically exhausted and enormous quantities of slag high in lead and low in silver were found scattered all over the valleys. Two smelters commenced operations in the early part of 1909 and during the year treated 11,850 tons of slag and 912 tons of ore, producing 5029 tons lead and 26,398 oz. silver. The slag averaged 46% lead and 1.78 oz. silver, the extraction being 88% of the lead and 96% of the silver. The bullion sold for £57,222. The operating costs included £24,833 for the transport of the slag to the smelters, £23,007 for treatment, and £11,682 for freight and realization of bullion. The profit and loss account also contains items of capital expenditure on the railway, smelter, stores, debenture interest, London expenses, and mine development, amounting in all to £121,000, and the adverse balance is £123,201, which is carried to the balance sheet. The company has been overweighted with capital and there were many different classes of ordinary and preference shares. Since the close of 1909 the capital has been rearranged by consolidating all the shares and writing them down to 312,046 shares of 4s. each of which 286,508 carry a liability of 2s. The total nominal issued capital had previously been £355,589. Reports by W. J. Loring and by Gerard Lovell, resident manager, are also issued. From these it appears that a third smelter has been

erected since the end of the year and that exploration at the mine shows that the Chinese had worked in sulphide ore as well as carbonate. An outline of the proposed plan of development is given, and it would appear that the profitable exploitation of the property will give the engineers an anxious time.

The Penhalonga company was formed in 1898 by the Anglo-French Exploration Co. to acquire a gold property in the Umtali district of Rhodesia, that had been previously tried several times. The ore contains gold and silver amenable to amalgamation, together with galena and cupriferous pyrite containing the precious metals. It is of low grade and its exploitation has always caused difficulties. A 40-stamp mill was erected in 1903 together with concentrating machinery and another 40 stamps was added later. The only dividend was 6% for 1907. The issued capital is £275,000 and there are £199,350 of debentures, some issued in 1905 and the others in 1907. The report of the consulting engineer, C. R. Pinder, shows that the content of the ore during 1909 is rather lower than during the previous year. The amount of ore mined was 198,604 tons, and after removing 41% of waste, 116,278 tons was sent to the mill. Only 60 stamps were running during the greater part of the year, owing to a greater proportion of the ore being removed before treatment. The average assay of the ore sent to the mill was 4.2 dwt. gold, 2^{3}_{4} oz. silver, and 28^{1}_{2} lb. lead per ton. The recovery was 3.47 dwt. gold, 27 dwt. silver, 16 lb. lead, and just under ½ lb. copper. The total recovery was 20,149 oz. gold, 156,265 oz. silver, 943 tons lead, and 35 tons copper. Of this 8710 oz. gold and 7571 oz. silver were obtained by amalgamation, and the remainder was produced from 2424 tons of concentrate which was shipped to smelters in Europe. The value of the amalgamated bullion was £37,844 and of the content of the concentrate £74,140. Against the latter is £15,154 the cost of shipping and smelting. Mining, milling, development, redemption, and other costs at the mine brought the expenses to £104,305, so that the profit at the mine was £7680. Other costs were, debenture interest £11,961, depreciation £7997, London and other expenses £2069. The credit side was increased by £393 refunded from income tax and a few small items such as transfer fees. The eventual result of the year's operations was an adverse balance of £13,900. A notable feature of the operations this year was the more liberal sorting. As regards ore reserve the figures on December 31 were 150,175 tons of developed ore and 51,000 tons of probable ore. This is lower than a year ago, for the reasons that much of the ore included then will now be removed by sorting and that some of the probable ore included last year has proved to be unprofitable. The financial position of the company is serious, because the debenture interest has been in arrear since October, 1909. An attempt was made to raise funds by reconstruction so as to carry out a scheme of development suggested by Mr. Pinder and by H. A. Piper, but shareholders did not respond. The future of the company is uncertain.

The report of the Dolcoath tin mine, Cornwall, for the half-year ended June 30 shows that a profit of £13,018 has been made, but no dividend is being distributed, as money is required for the equipment of the new main shaft. During the six months 47,279 long tons of ore was mined, and 853 tons of concentrate produced. The yield was 40.4 lb. per ton, and the receipts £75,639. Of the production 772 tons was sold at £91 per ton, and 81 tons of lower-grade slime sold for £66 per ton. Sale of copper ore and interest brought the total receipts to £77,372. The cost of £59,304 and lord's royalty £5049, leaving a profit as rendered above of £13,018. Comparing these figures with those of the two previous half-years, the amount of ore crushed is slightly greater, but the yield appreciably smaller. During the first half of 1909, the yield was 1000 tons or 49 lb. per ton, and during the second half, 904 tons or 42 lb. per ton. The average price obtained has, however, been greater, so that the total receipts and the net profits are nearly on a level. The expenditure on capital account during the half-year was £11,762, of which £10,867 was spent on the new main shaft. The total expenditure of capital, obtained by the sale of shares, since the formation of the company, is £124,731, of which the new shaft accounts for £101,230. The company has approximately £33,000 of capital left in hand. The manager, R. Arthur Thomas, reports that on May 12 sinking was completed at the new shaft, when the bottom of the sump reached 3300 ft. vertical from the surface. Cross-cuts were then started in each direction. The main lode is 150 ft. south of the bottom of the shaft. Connection between the new shaft and the workings had six months before been made by a cross-cut at 2940 ft., and the ventilation of the mine was greatly improved thereby. The Killas shaft has been put in order and a skip-road provided. At this part of the mine copper-tin ore is found and it is intended to start mining it when more development work has been done. The company has had an Elmore vacuum plant on the spot for some years waiting for this ore to be mined. In the Stray Park portion of the mine there are large quantities of zinc-copper ore, and investigations and trials have recently been made in connection with it. Some of the old Cornish stamps are now being dismantled to make room for 12 new Holman air-cushion or 'pneumatic' stamps. These will be driven electrically and six of them should be ready for work at Christmas. Additional dressing plant is also being erected. The amount of development work done during the half-year was 2568 ft. In Cornish mines the fashion for giving exact figures for ore reserves has never been adopted. The lodes vary so much that such figures would be of no value. But at Dolcoath there must be a great number of working points where there are plentiful reserves of ascertained value, for the management is able to bring to surface almost any grade of ore to meet requirements. Looking through past records it becomes plain that low-grade ore is treated when metal prices are high, and vice versa; these circumstances could not be accidental. In fact, it is Mr. Thomas' boast that whatever the price of tin Dolcoath always makes a profit.

LOS ANGELES, CALIFORNIA

California Oil Industry.—Huasteca Petroleum Co.— Johnnie Mining & Milling Company.

The directors of the Western Oil Producers' Association met here September 17 and effected a permanent organization by the election of officers. Norman Bridge was elected president and William M. Erb secretary; five vice-presidents, representing various oil companies, were elected. Five field committees were appointed and chairmen named for the resolutions, publicity, membership, and finance committees. All of the directors were appointed a committee of the whole to bring about a consolidation with the California Oil Men's Association of Bakersfield. A lengthy meeting of the executive committee of the California Oil Men was held in Bakersfield during the week. By-laws were adopted and the name of the organization was changed to the California Oil Men's Association. The next meeting will be September 24. The by-laws adopted state that the purpose of the association is to take up with the proper authorities matters that affect legitimate claims to oil lands in the public domain of California, and to do whatever is possible to advance the oil industry and to promote the prosperity of the men connected therewith.

Following the resignation of S. C. Graham as secretary of the Western Oil Producers' Association, the directorate of which is said to be opposed to further Governmental control, a new organization, to be called the Oil Conservation Association, is now being formed. It is learned that a first draft of by-laws already has been made and that a meeting will be called early next week. The aim of this association will be to unite all oil operators who are opposed to the conditions that have existed in the past, under which valuable public property has been acquired by private interests without any consideration to the Government in exchange for it; who are in favor of the restoration to the public domain of all of the oil lands now wrongfully and illegally held by private interests, and of conserving for the benefit of the whole people that portion of the National resources

represented by public oil lands and who believe that immediate and radical change in the law is necessary in order to regulate the manner in which private interests may acquire and operate such lands. The desire is not to withdraw publicly owned oil lands from use, but to prevent monopoly and to secure a fair distribution of the wealth they represent. Personally, Mr Graham believes in such legislation as would secure for the Government as large a revenue as possible consistent with the prevention of monopoly. He suggests a certain fixed royalty so that the President or any other Government official will have no reason or excuse to interfere with the handling of the product, or of changing conditions by the arbitrary withdrawal from use of public oil lands, or in any other manner. He believes that with a proper law, in which competition is provided for, there would arise no necessity of giving any one the power to suspend its operation anywhere or under any conditions.

The shaft of the Johnnie Mining & Milling Co., fourteen miles from Amargosa, Nevada, is now down 900 ft. and a station is being cut at that level. As soon as this is completed a cross cut will be started for the vein, which is

Johnnie Mine, Nye County, Nevada.

about 150 ft. distant. Up to the present time about 70 ft. of driving has been done on the ore on the 800-ft. level. This work shows the vein to vary from 7 to 10 ft. in width and from $3 to $20 per ton in gold. The showing so far is better than on the 700. Sinking in the shaft will be resumed before the end of the month, when the station on the 900 is completed. The shaft will be sunk to the 1000-ft. level. The Fraction Leasing Co., operating the Johnnie company's Fraction claim, started work about a month ago and within one week cut high-grade gold ore; little can be accomplished, however, until the hoisting plant is installed. Negotiations are still pending for the leasing of the Minnie May claim.

DENVER, COLORADO

Colorado Chapter of the American Mining Congress. — Deep Cross-Cuts.—Bard Creek.

The first meeting of the recently organized Colorado Chapter of the American Mining Congress took place late in August, and was not as well attended as should have been the case. The session was devoted mainly to the discussion of three questions, namely, mining locations on forest reserves, the sale of timber by the Government from its reserves in or close to mining districts, and the withdrawal by the Government of certain water-power sites and coal lands in the mining areas. In all three cases the argument was brought forward that the prospector and miner was about to be or already was a sufferer from the policy that the Government is pursuing. A committee of five was appointed to look into the first question, and one of three to collect evidence as to the second, both to report at the next regular meeting of the Chapter. No deferred action was taken as to the last. The discussion was pretty warm on all three points, in spite of the slim attendance. But as no prospectors or miners appeared with definite complaints, and no letters were read from such, the impression produced on listeners was to the effect that no real grievances existed on any one of these scores, and that the prospector and miner were quite able to take care of themselves. Also, that the Chapter was rather manufacturing a case against the Government. This is unfortunate for the first meeting, for if the organization is to gain any standing and spread into other States it must devote its attention to real issues.

Reports from the principal mining districts indicate that the year, so far, has been a most active one among the ore producers, and no deposits show up better than the old Boulder Gilpin Clear Creek fissure veins that represent the earliest discoveries in the State. It is doubtful if there is any other district in the West where so many steadily producing mines exist within such a small area. The mineralized belt in these three small counties is not over thirty miles long and five wide, but the output has been averaging nearly $3,000,000 per annum for the last fifty years, and shows no signs as yet of slowing down. There is hardly a square mile in this whole area that will not show up a dozen or more of producing mines or promising prospects. In some places the lodes are so close to each other that the claims are restricted to widths of 50 ft. It is also preeminently a region of cross-cut adits, for most of the stream valleys are deeply cut, producing innumerable opportunities to attain great depth on the veins with bores of moderate length. The majority of these enterprises originate in the valley of South Clear creek and its tributaries, from Idaho Springs up to the Continental Divide at Argentine. Between these two points there are over fifty deep cross-cuts in various stages of advance, and more than half of them are over 1000 ft. in length, while several count their extension in terms of miles. Of course the majority, the very large majority, have not yet justified their existence by becoming profitable enterprises, and perhaps many never will. Yet they keep going on into the great mountain walls of the valley year after year, scarcely a season passing without the commencement of new ones. A big hill, flanked by a deep gulch, is an irresistable attraction to the average miner. There is no use in telling him that experience has proved that in the great majority of cases fissure veins do not show appreciable gain in width or quality of mineral content as depth is gained, for he can easily quote cases where the contrary has proved to be true, and his ground is always an exceptional case, or going to oe. So the work goes on from season to season, and with enough encouragement in the way of new orebodies to keep up the enthusiasm. In fact, this zone has held out in depth astonishingly, and as the bulk of the deep cross-cut work in progress is being done by individual miners on their own time, or by companies out of the profits of the mines they have opened, it would not be wise to discourage the miners, even if it were possible. Perhaps the most interesting of them all at the present time is that which is piercing the Continental Divide at Argentine. It is a very old enterprise, begun years ago by that famous but now almost forgotten promoter, 'Brick' Pomeroy, and was expected to open untold wealth in the way of silver-lead ores. The distance through the divide at the tunnel level is some 8000 ft., of which about 5000 has been completed. Some encouraging ore developments have been found, but it is now considered that in the end the bore will be used to carry a narrow-gauge railway connection between Silver Plume and Keystone, as that would give the C. & S. R. R. the shortest line between Denver and all points to the west of it. While on the subject of tunnels, mention should be made of the new enterprise in that line which is to start in Birdseye gulch, one of the upper tributaries of the Arkansas river, and running in a general southerly direction, will undercut Prospect mountain. For many years a group of enthusiastic mining men of Leadville have believed that this hill, which lies directly to the north of the famous carbonate camp, was good mining ground, and much money and labor has been laid out in shafts upon it, which have developed little else than water and promising indications if the water could be handled. This will be accomplished to a certain degree by the proposed work.

There is still considerable excitement in and around the

new camp on Bard creek, to the north of Georgetown. This is really a revival of an old district, for Lincoln mountain was prospected for silver ores in the early seventies, and was a disappointment. The new finds are of gold ore. At the Beshear claim a foot of four-ounce ore is reported, and there are some encouraging developments in several other properties.

NEW YORK

Phelps, Dodge & Co.—Porphyries.—British Columbia Mines. — Shattuck-Arizona Listed.—Globe Mines.

The most important event of the week in financial circles was the purchase by Phelps, Dodge & Co. Inc., of a large holding in the Rock Island railroad. Some weeks ago a group of English and American financiers, known as the Pearson Syndicate, found themselves overburdened with securities in a declining market. They were relieved of the stocks and a bad market situation was saved by radical action on the part of leading Wall Street banking interests. The house of Kuhn, Loeb & Co. played a part in coming to the rescue of the market and took over a large block of Rock Island; it is this stock which has been purchased from Kuhn, Loeb & Co. by the Copper Queen people. The entry of the Phelps-Dodge company into well known railroad fields was taken by some hasty observers to mean a change of activity from the field of mining and smelting. Nothing could be further from the fact, nor is the matter of the management and conduct of a railway by any means new to the Phelps-Dodge interests. They have long controlled both the El Paso & Southwestern and the El Paso & Northeastern which handle all of their freight in Arizona. As a matter of fact the reason for the present purchase is to insure the continuance of amicable relations between these lines and the Rock Island; the latter road being the only outlet accessible to the former.

The announcement is now made officially that, while the Utah Copper has not enough stock of record to give absolute control of the Nevada Consolidated, yet there is more than enough stock in the Utah treasury to be transferred in due course. From the present record Utah lacks actual numerical control by 5363 shares. That this merger will be carried through is now admitted on all sides. The further steps in the consolidation of the Guggenheim properties, are not yet so officially announced; in fact, the merger of Ray Consolidated and Chino mentioned as the next important move, is emphatically denied by both Sherwood Aldrich, who heads the Ray Consolidated, and C. M. MacNeill, the president of Chino. Nevertheless such denial is held to be purely diplomatic. There has been some talk of an issue of new stock by the Chino of 100,000 shares to complete the financing of the mill. This also is emphatically denied by Mr. McNeill. The market sharpshooters are drawing some interesting comparisons between Ray Consolidated, Chino, and Miami. All three are low-grade milling coppers, all are expected to begin production with a part of the milling plants in operation shortly after the first of the year, and all are selling for practically the same figures, between $17 and $19. Ray Consolidated has something of an advantage in the amount of ore developed, having 75,000,000 tons as against 28,000,000 tons developed on the Chino, and 16,500,000 on the Miami. Recent work on the Chino has, however, on that part of the property known as the Hearst ground, developed some 10,000,000 tons of 3% ore. This is new territory and it is looked upon as certain that further work will greatly add to this tonnage. A study of the potential production of these mines demonstrates very clearly that at least during the years that the porphyries are taking the best out of the ground they will hold the complete domination of the metal market by reason of the immense quantities of cheap copper produced, cheap because produced in such quantity. The deep-level mines will apparently have to wait until steam-shovel pits shall have deepened and expense increased before they can make great headway as competitors of the porphyries.

The shareholders of Granby are looking forward very hopefully for the coming statement which is to embody both the report of Otto Sussmann, the later report by the vice-president, Jay P. Graves, and a detailed financial statement. Granby's copper costs have been running too high to admit of adequate profit, yet it is anticipated that a cash balance of $1,000,000 will be shown as against $600,459 on hand June 30, 1909. Diamond-drilling on hitherto unexplored portions of Granby has shown pleasing results and the record of this work will go far toward offsetting the showing of depleted ore reserves chronicled by Mr. Sussmann, whose report precipitated the slump last December. British Columbia appears to have reached something of a turning point. Since the General Development Co. interests got out last winter the stock has lost public favor. Now, however, it appears to have accumulated a quarter of a million surplus in cash and some $100,000 worth of copper in transit, and in the meantime to have enlarged and rebuilt two of its blast-furnaces so that the company is considerably stronger than at any time within the past three or four years. The gold and silver content has been running high in the ores and has so far reduced copper costs as to enable the company to lay copper down in New York at 7c. per pound. In the present condition of the metal market a dividend is hardly to be expected. The officials have announced their intention of building up a cash reserve of half a million dollars before considering making any distribution.

The 350,000 shares of the capital stock of the Shattuck-Arizona Copper Co., of Bisbee, has been admitted to trading privileges on the Boston Stock Exchange. The Shattuck is one of the recent successes of the Bisbee camp and enjoys the distinction of having made some of the cheapest copper produced in the country this year. One dividend of $1 per share has already been received by the stockholders. The Guggenheims are, evidently, not to rest upon their laurels in the development of their string of low-grade milling coppers brought to the producing point in this country. The work of the Braden Copper Co., in Chile, is being pushed with all possible speed. The mill of 2000 tons per day capacity is expected to begin operations in March next; the first unit of 400 tons is to be in operation within a few days. The company has some 8,000,000 tons of ore blocked out, showing an average copper content of 2.9%. The Barney Copper Co., of Globe, has been organized by J. D. Copelin, of Globe, who was formerly at the head of the old Inspiration Mining Co., now the Inspiration Copper Co. The Barney group consists of 27 claims adjoining the Keystone and the Live Oak. The new company has 1,000,000 shares, par $5, of which 300,000 shares are being offered to the public at 30c. per share. It is said that a minority interest in the Live Oak Development Co., at Globe, is attempting to secure control of the property with the object of consolidating it with the Miami which it adjoins. The movement was defeated at the recent meeting held in Bisbee, and a board of directors elected on the issue of the indepndent development of the Live Oak ground.

The Red Mountain Railway, Mining & Smelting Co. is to be reorganized and the stockholders will be asked to make an exchange of stock and to contribute 10c. per share toward a treasury to be used in development. The properties of the Red Mountain are in the San Juan district of Colorado and lie quite near the Camp Bird. The district has some splendid producing mines, the Camp Bird being the best known, but there have been many mining losses in the district also because mine development in San Juan is expensive and many good properties have scored financial failure because of insufficient funds. The discovery on the Spearhead claim at Goldfield has caused considerable market inquiry for the adjoining properties, Kewanas, Blue Bell, and Grandma. There is no denying the popularity of Goldfield issues in the East. No other mining camp has ever had such an enthusiastic following. Any developments that could assist the camp would be as warmly welcomed in the East as on the streets of Goldfield itself.

General Mining News

ALASKA

(Special Correspondence.) Reports from the district surrounding Valdez indicate that a gold vein camp of some importance is being developed in that neighborhood. So far only comparatively small gold bearing veins have been found, the largest averaging about 5 ft. in width, but as the ore is high grade and free milling, the camp is especially suitable for enterprises on a small scale. Within the last two months, probably a dozen finds of much promise have been made, and many samples of ore containing visible free gold are being exhibited. The excitement commenced with the beginning of a stamp mill run at the Cliff mine, a property situated a few miles down the bay from Valdez. There a yield of about $1000 a day has been made throughout the summer from a comparatively small vein, the workings on which are stated still to be in $50 ore. This mine is being operated with an equipment that cost only about $25,000. The character of other claims is such that several of them can each be equipped as cheaply.——On Mineral creek, which runs northward from the bay, through a slate formation, but two or three miles from Valdez, several discoveries of high grade ore have been made. From the Oregon, distant three miles from town, a trial shipment of 1000 lb. of ore from a 2-ft. vein has lately been made. A little higher up Daniel Kain has a 5-ft. vein of milling ore, this being the largest vein found on the creek. Around the head of the creek there are several veins, varying in width from 18 to 30 in., that give high assays near the surface. Preliminary development is being done at a number of places situated within a few miles of Valdez, and there is little doubt that some of the prospects will by next spring warrant the provision of an equipment similar to that at the Cliff mine.

Valdez, September 10.

The report of the Alaska Mexican Gold Mining Co. for the month ended August 15, states that the mill ran 31 days and crushed 20,412 tons of ore. The estimated gross value of the free gold was $34,509.96 with 380 tons of concentrate saved that was valued at $35,916.12 which brought the total production to $70,426.08. The realizable value was $67,800.98, and the operating expenses $29,261.56, leaving a net operating profit of $38,539.42. Construction expense amounted to $14,463.54. The yield per ton of ore milled was $3.45 and the stock of broken ore was increased 534 tons for the month.

ARIZONA

COCHISE COUNTY

Construction work is going on at both the Copper Queen and Calumet & Arizona plants at Douglas. At the Calumet & Arizona plant there are three 500 and three 300-ton furnaces, two of the original ones of 300 tons capacity having been increased to handle 500 tons. It is now proposed to enlarge the remaining smaller furnaces to the same capacity as the larger ones, thus increasing the capacity of the plant 600 tons.——A force of men is at work at the Copper Queen plant erecting an addition to the flue-chamber which is to cover a space of 5500 sq. ft. The frame of this structure is to be of steel, and the walls of brick, the same as in the original building. Besides this addition to the flue-dust chamber a separate flue is to be provided to carry the smoke from the converters to the stack. The smoke from the converters heretofore has passed through the dust chamber to the stack. Plans are now under consideration for the addition of a reverberatory plant that will cover a space of 3000 square feet.

GILA COUNTY

(Special Correspondence).—At a meeting of the stockholders of the Live Oak Development Co., held at Bisbee, September 13, Henry B. Hovland, of Duluth, Hoval A. Smith, of Bisbee, and S. F. Kaufmann, of Chicago, were re-elected. A certain element of the stockholders attempted to dominate the meeting with a view to transferring control of the company to the Lewisohns who exploited the property of the Miami Copper Co., but were unsuccessful in their efforts.——All development has ceased at the property of the National Mining Exploration Co. for the reason that the employees, failing to obtain their pay checks on September 10, refused to continue operations. It is possible that N. L. Amster, president of the Arizona Commercial Copper Co., who holds a note for $100,000 secured by the National property and payable September 24, may secure possession of the claims.——At the Arizona Michigan property all underground work except the sinking of a winze on the Old Dominion vein, has been discontinued.——The Miami Copper Co. is operating only seven machine drills underground as the amount of development already done is in excess of that necessary for the beginning and maintaining of production.——The extraction adit of the Inspiration Copper Co. has been connected with the Joe Bush shaft on the 275-ft. level. The test mill built near the Joe Bush shaft will begin treating ore at the rate of about 75 tons per day within a month.——The sinking of the McGaw shaft on the property of the Superior & Boston Copper Co. has been resumed and is now in progress at a depth of 847 feet.

Miami, September 16.

MOHAVE COUNTY

Shipments are now being forwarded from the Banner group of mines on Stockton hill to the Needles smelter, and it is reported that regular consignments of lead ore will be sent to the plant for the present and later the zinc ore will be mined.——The Tom Reed shipped $38,000 worth of bullion, the result of the semi-monthly clean-up.——The Gold Road shipped $20,000 worth of bullion, the results of the week's run.——Plans are being formulated for the driving of a 1300-ft. adit that will open the Samoan, Lucky Boy, and a number of other veins in the Chloride district at depth.

YAVAPAI COUNTY

Edward Ord, representing Eastern capitalists, has secured a 90-days' bond on the Kinney group of 14 claims in Eugenie gulch and will commence the work of examination at once. A 225-ft. shaft has been sunk on the ground and over 1000 ft. of driving done which exposes a large vein of free-milling ore.——Arrangements have been made for the resumption of work on the Mid Day property on the Peck lode near Mayer which is supposed to be the extension of the old Peck mines. About 500 ft. of development has been done which includes a shaft of 60 ft.——Work is soon to be resumed on the McMahon group and the old Zonia mines near Placerita.

YUMA COUNTY

Active development on the Eaton property in the Parker district has been started under the superintendence of Samuel Jacoby. There are 17 claims in the group on which a number of shallow shafts have been sunk and drifts driven showing a large body of copper-gold-lead-silver ore.

CALIFORNIA

AMADOR COUNTY

The Lincoln Consolidated Mining Co., which is reopening the old Lincoln mine at Sutter Creek, has issued call No. 2 for 10c. per share to carry on development. The statement details that the company has re-timbered the shaft 127 ft. and installed new cables, that the shaft is now opened 150 ft. and is still in heavy ground though it is expected to pass through this within the next 100 ft., and that the company has purchased the mineral rights of the town lots adjoining the property.——The old shafts at the Alpine mine are being cleaned out and re-timbered and new machinery will be forwarded to the property.

LASSEN COUNTY

The mining town of Hayden Hill was completely destroyed by fire and the mine has been closed down. Operations will be suspended till freight can be taken in next spring.

NEVADA COUNTY

A flood of water in the new workings of the Brunswick mine in the Grass Valley district caused operations to be

suspended temporarily and the men have been laid off. The new shaft is 450 ft. deep and about on a level with the old workings which are 1200 ft. deep and which are thought to be the cause of the trouble. It was known that the water would have to be removed some time but it was thought that the new shaft would be near its completion, 1000 ft., before this would have to be undertaken.——The chlorination plant at the Delhi mine has been rehabilitated and will commence treating a pile of 200 tons of concentrate that has accumulated from the operation of the mill. The work of sinking the new shaft has been completed and stopes opened that will supply the mill which will resume some time this fall.

SHASTA COUNTY

The dredge of the Consolidated Gold Dredging Co. sank in 16 ft. of water in the Sacramento river near the mouth of Middle creek while being hauled to a new point of operation. While passing over a riffle the water washed over the sides of the boat and flooded it. Practically no damage was done either to the machinery or the hull and it will be but a few days before the boat is raised and in operation again.——The town of Salee, a short distance from Winthrop which was burned last July, was destroyed a few days ago by fire.——J. B. Keading, manager for the Bully Hill Copper Mining & Smelting Co., has returned from the East and is now at the mine.——The Mammoth Copper Co. has finished the building of its stock piles for the winter and stopped running the aerial tram.

SIERRA COUNTY

It is reported that a new shoot of rich ore has been opened at the Gladstone quartz mine near Table Rock, and that there is a general revival of mining interest in that district. Operations are to be resumed at the Miners' Home drift mine and the adit will be driven to open the gravel.——E. R. Argersinger has obtained control of the stock in the Squires Mining Co. which owns property in the Secret Canyon district and is reorganizing the company to develop the claims. ——A 5-ft. vein containing considerable arsenical sulphide has been opened on the Roosevelt claim, three miles east of Forest.——W. A. Derrer and associates, of Los Angeles, are driving a drift on the vein at the Alpha Derrer group on Rock creek. Over 300 ft. of work has been done on the vein which follows the serpentine contact.

SISKIYOU COUNTY

Title to the Azalia and Fern Leaf claims has been granted to Reeves Davis and Henry C. Howard, who were being sued by A. E. Head and Henry Dempsey to obtain possession of the ground. The property is in the Happy Camp district and is crossed by a large vein of gold-bearing ore.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence).—E. C. Bovie has sold a one-half interest in a group of claims on Lincoln mountain to Schofield & White for $20,000. The same operators have taken a bond and lease on the property of the Homestake Gold Mining & Milling Co., the bond calling for $50,000 and payable in two years. A heavy plant of machinery will at once be purchased.——Large development is in progress at the Blue Ridge property on Columbia mountain. Shipments of smelting ore will be started some time during the present month.——Work is under way at the Hidden Treasure property in East Argentine. Swanson & Johnson, the owners, state that the adit will be driven throughout the winter months.——M. Bonham & Son, owners of the North Star property, brought down a test shipment of two tons of ore this week. Assays show a value of 500 oz. silver and 20 oz. gold per ton.——I. G. McGuire, owning the Black Prince property at Camp Beshears, has interested a number of Chicago capitalists and the holdings will be turned over for a cash consideration of $10,000.——A carload of smelting ore was sold last week by the Burleigh Mining & Milling Co., operating a lease on the Pelican level to the east of the Perdue shaft. Settlement was effected at the average rate of 335 oz. in silver per ton.——Frank Graham, operator of the Scotia mill, shipped 15 tons of lead ore last week that milled 40% in that metal and 40 oz. in silver per ton. At the same time 18 tons of 45% zinc was sold, as well as 10 tons of iron. This was the result of a run of 26 days.——Motor cars to be driven by electricity are to be installed at the Central adit. The adit is in nearly two miles, while laterals have been driven to the Shafter, Lake, and Kentuck veins.

Georgetown, September 17.

GILPIN COUNTY

(Special Correspondence).—H. Boellert & Co. have taken a lease on the After Supper mine at Black Hawk. Water is now being raised from the 250-ft. shaft. It is proposed to start driving from the 100 and 250-ft. levels.——A shipment of 16 tons of ore from the lease being worked on the Pewabic mine by Joseph Reese brought a settlement of 4.50 oz. gold, 6 oz. silver, and 11% copper.——A lease has been granted to Gundy & Co. on the West Pewabic mine. The shaft that is down 140 ft. is to be sunk another 60 ft.—— George R. Steuart is installing a water system in Russel Gulch and Nevadaville.

Central City, September 17.

BOULDER COUNTY

Development that has been in progress for several years at Eldora has recently resulted in the opening of orebodies from which continuous shipments with large earnings may be expected. Just south of Eldora, and extending from Spencer mountain to the Continental Divide, is a strip about half a mile in width and five miles in length that has produced quantities of high-grade telluride ores from surface workings. The recorded production from the Enterprise shaft, 400 ft. in depth, has been $150,000. As depth was reached, however, the inflow of water became so great that further operations through the shaft were unprofitable. To provide drainage and to eliminate hoisting, the Swarthmore adit was started. At a distance of 1600 ft. from the portal and 1000 ft. below the surface, this adit has cut an 8-ft. vein, one-third of which is milling ore averaging from $25 to $26 per ton, while an 18-in. streak gives returns of $936 per ton, principally gold. After raising 600 ft. to connect with the shaft, the manager, H. H. Carpenter, expects to put 50 men on production. The property is equipped with a 350-hp. plant, driven by water power, and the portal of the adit is adjacent to the tracks of the Denver, Boulder & Western Railway.——At the Lost Lake, in the same telluride belt, an adit cut into pay-ore last March, and the property, under the management of Wilson Davis, is shipping $40 ore.——The Highland Mary adit, on the Revenge, another neighboring property, will probably reach the vein within the next 200 to 300 ft. H. W. Brougher is the manager.——At the Fourth of July, which is opening a vein 250 ft. wide, farther up on the Divide, the manager, W. A. Brooks, is putting in diamond-drills to prospect for oreshoots.

GUNNISON COUNTY

Arrangements have been perfected for the construction of a wagon-road from the Crested Butte & Gunnison branch of the Rio Grande system to the Star mines in the Italian Peaks district. This road will open a rich belt to development as it covers a territory between the old Montezuma and Doctor mines. As soon as the work is completed teams will be started hauling from the Star mine in which a large amount of ore assaying 40 to 60% lead is blocked out.

LAKE COUNTY

The opening of a shoot of high-grade ore on the 750-ft. level of the No. 3 shaft on the Little Johnnie property, at Leadville, has stimulated prospecting near that ground and a number of lessees are opening new territory.——The Across the Ocean shaft is down 212 ft. and at this point cross-cutting has been started to open the ore.——An electric hoist has been installed at the Rattling Jack and active prospecting is under way.——The Little Ella is now being operated through the Yak tunnel as it was found too expensive to handle the ore through the shaft.——Supplies for the re-timbering of the shaft of the Great Eastern mine on Prospect mountain are being taken to the mine

and the first 200 ft. of the ground will be put in good condition this winter.

SAN MIGUEL COUNTY

A group of Denver and Colorado Springs capitalists have organized a company to take over the Suffolk group at Ophir and will reopen the mine which has been idle for the past twenty years. The ground was located in 1878 and proved rich from the surface though in the later days of the operation of the mine a leasing system prevailed which resulted in the extraction of all the high grade ore with no development work. It is believed that the sale of this property will lead to an increased activity in this district which has been somewhat neglected by mining interests recently.

TELLER COUNTY

Development on the Chicken Hawk property on Guyot hill in the Cripple Creek district is resulting in an increased production, and it is expected that a carload of ore per day will soon be forwarded from the mine. The present output amounts to 500 tons per month. Two shoots are opened in the lowest levels on which the stopes show a width of two and four feet respectively.——About 40 cars per month of ore that assays $30 to $200 per ton are being stoped on the 1000 ft. level of the Strong mine.——The Union Leasing Co. is shipping a carload of ore per day from the Gold Dollar mine which it is operating under lease.——A powerful electric hoist has been installed at the shaft on the Forrest Queen mine and the lower levels of the claims will be thoroughly prospected for the shoots that are believed to traverse the ground.——The orebody recently opened by Crooks & Co. on the ninth level of the Ruby property on Bull hill is reported to be improving with development, the face showing a width of three feet. A carload of screenings shipped a few days ago is expected to average $80 per ton.——The General Leasing Co., operating at a depth of 300 ft. in the Jack Pot property, is preparing a shipment which it is believed will net the company $50 per ton.

MISSOURI

SAINT FRANCOIS COUNTY

The Eastern Lead Co. has taken over its option on the J. Day land, near Desloge, and has started sinking the shaft, which will be about 400 ft. deep. George K. Williams, former mine inspector, is in charge.

IRON COUNTY

It is reported that the Puxico Iron Co. has leased Pilot Knob and Iron Mountain from the Big Muddy Coal & Iron Co., and will begin opening the old stopes and developing new orebodies at once. Several drill-holes have cut 50% ore. P. J. Crawford is president, and William Chauvenet, engineer.

NEVADA

ESMERALDA COUNTY

(Special Correspondence).—During August the Eclipse mill treated 876 tons of ore from the company leases on Tramp Con. The bullion shipments are estimated at about $12,000. In the Eclipse workings narrow stringers of high-grade ore have been encountered at a depth of 500 ft. Excellent milling ore has been found below the Eclipse fault.——The Penn Mining & Leasing Co. is making regular shipments to the Needles smelter, in addition to its ore treated at the Crystal mill. The selected ore assays about $40 per ton.——Ben Chambers has made arrangements whereby ore from his lease on the Original Bullfrog will be treated by the Goldfield Consolidated. All the ore assays over $7.50 per ton.

Rhyolite, September 16.

NYE COUNTY

(Special Correspondence).—Progress on the diamond-drill hole at the 800-ft. level of MacNamara has been temporarily delayed, due to the sticking of the bit at a depth of 320 ft., which necessitates the reaming out of the borehole to that depth. The large quartz vein on the 800-ft. level has been cross-cut 50 ft. without reaching the opposite wall. Extensive work will be undertaken in following shoots in this vein. A Leyner drill sharpener has been installed.——The profitable ore developed in the westerly extension of the West End vein on the 400-ft. level has decided the general manager, S. H. Bradley, to sink the shaft to 500 ft. To facilitate the greater output of the mine and cut operating expense the cage will be replaced by a two ton counterbalanced skip and the steam plant and hoist by a 100 hp. electric hoist.——A reported discovery of $500 silver ore in a well defined vein fifteen miles from Tonopah in the vicinity of Silver Glance caused a small rush to the district. Although overestimated, it is a fair prospect.——The stamp mill at Liberty, fifteen miles from Millers, is about completed and C. R. Olsen has resigned his position with the Desert mill at Millers to take charge of the new plant.

Tonopah, September 17.

NEW MEXICO

SIERRA COUNTY

(Special Correspondence).—A contract has been awarded to Lewis Orear for 100 ft. of sinking in U. S. Treasury shaft No. 1 and for 100 ft. of raising from the breast of

U. S. Treasury Shaft.

north level No. 2 to connect with the bottom of White Eagle shaft No. 1. Work has started and is progressing rapidly. The shaft sinking is for the double purpose of development and water supply, and recent increase in the flow of water in No. 2 level both north and south justifies the expectation that an additional 100 ft. of sinking will supply all the water needed for mining operations and for the proposed mill. When the raise to the White Eagle shaft is finished it will complete the first unit of development at this property and will place the mine in position to supply a 100-ton mill for several years. The top of the big dump shows ore of bonanza grade from the lowest workings. A six-ton run of dump-ore was recently made at the Morrison crusher on the Keystone property in the north end of the district, and it is understood that a considerable portion of the pulp is en route to the office of the company for preliminary mill-tests.——The Silver Monument property, whose operations have been handicapped by lack of water, is again in full operation following recent heavy rains.——Work on the Black Range Reduction Co.'s mill is progressing slowly, most of the workers having recently been laid off. It is announced, however, that the mill will be ready to receive ore in about sixty days.

Chloride, September 17.

SOCORRO COUNTY

(Special Correspondence).—The reorganization of the Mogollon Gold & Copper Co. has been effected and a letter issued by the president to the stockholders. It is understood the first work will be advancing the east drift from the cross-cut on the Little Charlie and retimbering the shaft on the Cooney mine.——A member of the metallurgical staff of Spurr & Cox spent a week in camp with the general manager of the Socorro mines, experimenting with a view to increasing the saving now being made in this mill.——Concentrate for the week at the Ernestine amounted to 44 sacks, from 435 tons of ore crushed. Development of the seventeenth level west is being pushed. As soon as the accumulation of ore from the different raises in the adit-level can be removed, the main adit will be extended farther into the top ground. A survey has been completed for the pipe-line from a point about one mile above Mogollon to the pumping station. This line will furnish a permanent water supply for the plant as well as reduce the power consumed in pumping to the mill.——Work in the Deadwood mines has been temporarily discontinued, all efforts being concentrated on mill construction. Three carloads of machinery and supplies arrived during the week.——The cross-cut at bottom of winze of the Enterprise Mining Co., below the second level, has exposed four feet of good ore. The winze below No. 5 level is in a large vein of low-grade ore.

Mogollon, September 16.

UTAH

JUAB COUNTY

The Colorado Mining Co. paid the regular quarterly dividend of 6c. per share September 20, and Iron Blossom has posted a similar amount to be distributed on the 26th. In the assessment columns are Beck Tunnel, Black Jack, and Uinta Treasure Hill companies, each calling on their stockholders for 1c. per share.——Development has been resumed at the King William property through the 1000-ft. level of the Eagle & Blue Bell and will be carried forward from this point which represents a depth of 1600 ft. in the King William property for some time. When this has been well advanced a drift will be started on the 500 to open that portion of the King William territory.——The ore from the Centennial Eureka mine is now coming to the surface through the Holden tunnel and the gravity tramway which has been in use for about ten years, bringing the ore from the mine to the railroad, is idle. Most of the shops and surface buildings will be moved to the mouth of the tunnel and the men will in the future go to work that way.——The assessment work for the year has been started on the Montana group in the eastern portion of the district.

SALT LAKE COUNTY

New equipment has been added to the Wasatch-Utah mill in the Big Cottonwood district, and five stamps are now dropping on $50 ore. The company has blocked out a large amount of ore and is considering the advisability of installing electric equipment in the plant.

WASHINGTON

STEVENS COUNTY

Development of the tungsten district shows the properties to be in a position to commence a large ore production at any time additional milling equipment is installed. Several tons of concentrate has been sent to the market. Prospecting is proceeding at many points in the field, embracing an area of ten by forty miles, and corporations are being formed for development on a broad scale."——Conrad Wolfle, of Spokane, president and manager for the United Copper Mining Co., operating near Chewelah, announces that three tons of ore sent to the Granby company's smelter at Grand Forks, British Columbia, netted $685.28, the distribution being 19.81% copper, 347 oz. silver, and 0.18 oz. gold per ton.——The Republic Mines Corporation, controlled by Spokane men operating near Republic, paid its fourth dividend of 1½c. per share, or $15,000, on September 9.

CANADA

BRITISH COLUMBIA

Considerable development is being advanced in the Portland Canal district and good showings obtained on many of the claims. Lack of cement for the machinery foundations has held back the work at the Portland Canal group though the contract on the mine buildings and houses for the men is being rapidly completed.——At the Salmon Glacier the series of open-cuts has shown a body of galena ore with some gold in a silicious gangue.——In addition to the adit being driven at the Rush-Portland work has been started on the Ne Plus Ultra vein.——On the Portland group the vein has been shown to be 12 ft. wide by a number of open-cuts and an adit has been started that will tap the vein 150 ft. below the outcrop.——The drift at the Red Cliff is in over 800 ft. and the winze is being sunk in a good grade of ore.——The work at the Surprise consists of stripping the Granite vein the development disclosing an ore that is worth approximately $25 per ton.

ONTARIO

Thirty to forty tons of ore per day is being run through the mill at the Savage property in the Cobalt district, and five drills are kept busy underground driving both directions on No. 3 and No. 4 veins and stoping on No. 3.——New camp buildings, including a power-house, shaft-house, and office, have been completed at the Haileybury Frontier mine in South Lorrain and a compressor and motor installed. A cross-cut is being driven a short distance on the 150-ft. level to pick up the 20-in. vein of ore on which the 3000-oz. shoot was opened.——The Green-Meehan, in North Cobalt, has been leased to E. C. Kingswell who will reopen the property. The dump will be concentrated first followed by underground prospecting.——Two new bodies of ore have been cut at the Beaver both of which will assay in the neighborhood of 5000 oz. silver per ton.

MEXICO

CHIHUAHUA

The directors of the Rio Plata Mining Co. have declared the regular quarterly dividend of 2%. The August production of the mine amounted to 83,114 oz. of silver bullion and concentrate.

HIDALGO

The Compañia Minera Santa Ana y Anexas, of Pachuca, has equipped the property with electric machinery, power being purchased from the Compañia Electrica y Irrigadora and transformed from 6000 to 400 volts. A Wellman-Seaver-Morgan double-drum hoist with a hoisting speed of 700 ft. per minute is a portion of the new installation.——The Compañia Minera Santa Ines, Carretera, has also purchased an electric hoist and motor which will be installed at an early date.

OAXACA

The tube-mill at the Natividad y Anexas that was broken recently has been repaired and the plant is again in running order. It is estimated that the property will now produce $30,000 to $35,000 worth of bullion per month. During August the management shipped 21 bars that represented $22,800, the production for that month.

SONORA

Good progress is being made on the new steel reverberatory building at the Greene-Cananea plant, the frame for the building having been completed and preparations made for the installation of two 1850-kw. turbines. The building to house eight new McDougalls is completed and the foundation for the machinery installed.——The old shaft at the Cananea-Boston has been cleaned out and a 3½-ft. vein of galena ore containing 150 oz. of silver exposed at a depth of 40 ft.——E. G. Brassington, of San Diego, has purchased the Rosario mine in the Pilares district and will commence shipping ore about the end of October. A shaft is now down 100 ft. opening a silver-copper ore and this will be continued to the 200-ft. level with drifts started on both levels.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. F. Ferrier is expected from Toronto.

Charles J. Hutchinson has gone to New York.

Frank H. Probert has gone to Portland for a week.

J. Nelson Nevers was in San Francisco going to Oregon.

George S. Rice was in Chicago on his way to Los Angeles.

Arthur G. Black has left San Francisco for Nome, Alaska.

J. A. Holmes will attend the Mining Congress at Los Angeles.

E. N. Skinner, of New York, was at Reno on his way to Arizona.

J. W. D. Moodie, of Los Angeles, is in New York on business.

John G. Worth, of Denver, is at Reno, Nevada, returing from Ely.

J. B. Farish left San Francisco for Denver and New York this week.

E. F. Burchard is at Portland and will be in San Francisco October 10.

E. L. Porch has just returned to San Antonio, Texas, from northern Mexico.

J. B. Stewart will go to Nicaragua early in October to examine the Luna mine.

Oliver B. Finn has moved from Portland, Oregon, to Coatesville, Pennsylvania.

E. W. Parker was in San Francisco on his way to the Mining Congress at Los Angeles.

S. E. Bretherton is in Los Angeles attending the meeting of the American Mining Congress.

William R. Jewell has been examining mining property in Mariposa county, California, for Bakersfield capitalists.

Alexander P. Rogers is in San Francisco for a few days on his way to New York from a professional trip to Siberia.

W. Murdoch Wiley and Charles S. Herzig are at Elko, Nevada. They have been on an extended trip through the West.

George E. Farish, who has spent the summer examining placer ground in Alaska, is now on his way to Durango, Mexico.

A. S. Howe, of the Constant-Herzig Co. staff of engineers, is making an examination of placer ground in Madison county, Montana.

Charles S. Herzig, president of the Constant-Herzig Co., has been appointed consulting engineer of the Jumbo Extension Mining Company.

Roy H. Allen has returned from Massachusetts to Mexico, where he is manager for the Sierra Plata Mining Co., at Villa Escobedo, Chihuahua.

Walter H. Bunce resigned as manager for the Hercules Con. M. Co. at Silverton, and is now general manager of the Sunnyside mines and mills of the John H. Terry Estate.

H. Foster Bain, Corey C. Brayton, E. H. Benjamin, F. W. Bradley, S. B. Christy, Francis Drake, L. A. Greene, C. W. Merrill, M. L. Requa, and Sumner S. Smith will be among those attending the meeting of the American Mining Congress at Los Angeles next week.

H. A. Megraw will establish an office as consulting engineer at San Luis Potosí, Mexico, on October 1. He has been appointed consulting engineer for the Cia. Minera Angustias, Dolores y Anexas, the Cia. Minera y Beneficiadora Ojo de Agua, and for a private company at San Luis Potosí.

A mechanical draughtsman, experienced in the design of metallurgical equipment, is wanted. Apply care of *Mining and Scientific Press*.

Company Reports

AMERICAN SMELTING & REFINING CO.
AMERICAN SMELTERS SECURITIES CO.

The recently issued annual reports of these companies should be gratifying to stockholders. The former company's report shows net earnings of $7,507,916 for the year ending April 30, 1910, although this was a decrease of $204,063 from that of the previous year. During the year $461,638 was spent on new construction and improvements, leaving $7,046,278 for distribution in dividends. After deducting $3,500,000 for preferred dividends, $3,546,278 was available for dividends on common stock. The Smelters Securities company report shows a net earning of $5,202,310, being a gain of $1,575,884 over that of the previous year, equivalent to about 45%, and increasing the surplus by $1,133,425, which gives that concern a total surplus of $1,688,197. The A. S. & R. Co. owns $17,000,000 of the common stock of the Smelters Securities company, which makes its equity in the final surplus of the latter $650,000, or 13% on the common stock of A. S. & R. Co. The Smelters Securities company has been a heavy borrower from the A. S. & R. Co. for working capital. The latter has closed, and practically abandoned many of its plants, though over $9,000,000 has been expended the past eight years in new construction and writing off depreciation of the operating plants. The rate of charge for depreciation the past three years is low; being but about 0.5% per annum. As indicative of the increasing volume of business of the A. S. & R. Co. is the fact that its working capital has been steadily increased. In 1904 it was $19,233,834. In 1910 it had grown to $28,914,482. A comparison of its annual net earnings during the years 1900 to 1910, is interesting.

NET EARNINGS

1910	$7,507,916	1904	$7,905,572
1909	7,711,979	1903	7,576,785
1908	7,633,286	1902	4,801,519
1907	11,509,669	1901	3,828,441
1906	10,161,358	1900	1,979,908
1905	8,898,811		

WAIHI GOLD MINING CO.

The annual report from this great New Zealand mine for the year ended December 31, 1909, has just been received. During the year 416,813 tons of ore were treated, yielding in gold and silver £959,593 18s. 11d. To this amount was added £10,439 16s. 4d., being interest on investments, which brought the total receipts to £970,033 15s. 3d. Expenditures were £363,851 10s. 3d., leaving a gross profit of £606,182 4s. 8d. There was carried forward from the previous year a balance of £28,353 1s. 6d., making a total of £634,535 6s. 2d. There was set aside for new machinery and betterments £36,151 7s. 7d. in addition to which 10% was written off for depreciation of plant, being £36,963. The directors also provided £40,778 17s. 6d. toward the Hora Hora hydroelectric scheme. Dividends to the amount of £396,725 12s. were paid during the year, being about £24,000 greater than the amount paid the previous year. From the surplus a bonus of 18s. per share was ordered paid. The mine report states that there remained in sight in the mine 1,335,586 tons of ore in addition to a large amount in pillars and arches which will, in time, be extracted. This, without further development, indicates over three years' ore still in sight in this great property.

TEWKSBURY AMALGAMATED GOLD DREDGING CO.

The annual report of the Tewksbury Amalgamated, of Australia, for the year ended August 30, 1909, shows that during the year 1,181,609 cubic yards of gravel were dug and sluiced by the dredges. The amount of gold recovered was 2.746d. per yard, at a cost of 1.758d. per yard. The profit above working cost was 0.988d. per cubic yard.

Market Reports

LOCAL METAL PRICES.

San Francisco, September 22.

Antimony	12—12¾c	Quicksilver (flask)	46
Electrolytic Copper	14½—16¼c	Spelter	7—7¾c
Pig Lead	4.70—5.65c	Tin	37½—39c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Sept. 15	12 35	4.40	5.42	53¼
" 16	12.35	4.40	5.42	53⅛
" 17	12.35	4.40	5 45	53¼
" 18	Sunday.	No market.		
" 19	12 30	4.40	5 41	53¼
" 20	12.30	4.40	5.40	53⅜
" 21	12.30	4.40	5.30	53⅜

ANGLO-AMERICAN SHARES.

Cabled from London.

	Sept 15. £ s. d.	Sept. 22. £ s. d.
Camp Bird	1 12 0	1 12 0
El Oro	1 6 9	1 7 0
Esperanza	2 14 4½	2 13 0
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 6	0 6 6
Mexico Mines	9 1 3	9 13 9
Tomboy	0 16 3	0 16 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices. Sept 22.		Closing prices Sept. 22
Adventure	6	Mohawk	47
Allouez	41¾	North Butte	26⅝
Atlantic	6	Old Dominion	36
Calumet & Arizona	58	Osceola	125
Calumet & Hecla	543	Parrot	13
Centennial	16	Santa Fe	1½
Copper Range	65	Shannon	9½
Daly West	4⅞	Superior & Pittsburg	11
Franklin	11	Tamarack	60
Granby	32	Trinity	5¼
Greene-Cananea, ctf	6½	Utah Con	22½
Isle-Royale	20	Victoria	2½
La Salle	9¾	Winona	7
Mass Copper	7	Wolverine	115

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Sept. 22.		Closing prices, Sept. 22.
Amalgamated Copper	63⅛	Miami Copper	18⅞
A. S. & R. Co	66⅛	Mines Co. of America	9/16
Braden Copper	37/8	Montgomery-Shoshone	5/16
B. C. Copper Co	6⅝	Nevada Con	19¼
Butte Coalition	18	Nevada Utah	¾
Chino	17	Nipissing	10⅞
Davis Daly	2	Ohio Copper	1⅝
Dolores	6¾	Ray Central	2⅛
El Rayo	3¾	Ray Con	18¼
Ely Central	⅛	South Utah	1¾
First National	3⅞	Superior & Pittsburg	11⅜
Giroux	6⅛	Tenn. Copper	33⅛
Guanajuato Con	⅞	Trinity	5½
Inspiration	7⅛	Tuolumne Copper	1⅞
Kerr Lake	6⅜	United Copper	4⅝
La Rose	3⅞	Utah Copper	45
Mason Valley	9⅜	Yukon Gold	3⅞

SOUTHERN NEVADA STOCKS.

San Francisco, September 22.

Atlanta	$ 14	Mayflower	$ 5
Belmont	4.35	Midway	20
Booth	11	Montana Tonopah	1.00
Columbia Mtn	5	Nevada Hills	2.47
Combination Fraction	40	Pittsburg Silver Peak	48
Daisy	4	Rawhide Coalition	11
Fairview Eagle	41	Rawhide Queen	25
Florence	2.20	Round Mountain	47
Goldfield Con	8.25	Sandstorm	5
Gold Kewenas	8	Silver Pick	8
Great Bend	3	St. Ives	20
Jim Butler	29	Tonopah Extension	1.05
Jumbo Extension	52	Tonopah of Nevada	9.00
MacNamara	31	West End	59

(By courtesy of San Francisco Stock Exchange.)

The Prospector

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

G. H. M., Santa Cruz, California: Basalt with chalcedony in amygdules.

E. E., Alleghany, California: Massive pyrite with earthy brown limonite.

L. C. W., Huizopa, Mexico: No. 1, a fine grained syenitic rock with minute specks of hematite; No. 2, metarhyolite.

J. F. S., Detroit, Oregon: No. 1, quartzite with pyrite; No. 2, quartzite with pyrite and chalcopyrite; No. 3, quartzite with crystals of black chalcocite, brass yellow chalcopyrite, bronze brown bornite, and brownish grains of sphalerite.

COMMERCIAL PARAGRAPHS

THE AMERICAN WELL WORKS, Aurora, Illinois, is represented in the West by agencies at the following addresses: 70 Fremont street, San Francisco; 341 South Los Angeles street, Los Angeles; 1245 First Avenue South, Salt Lake City.

THE EDMUND T. PERKINS ENGINEERING CO. has been organized with offices at First National Bank building, Chicago, for the purpose of examining, constructing, and reporting upon engineering work, especially for irrigation purposes.

THE AUTOMATIC GOLD SEPARATOR, LTD., of Los Angeles, claim to save all of the free gold contained in any silicious ore. By free gold they mean any gold that can be made free by fine grinding. To prove their statement they have installed a complete reduction plant, including their amalgamator and an 8-ft. Hardinge pebble mill. They will be glad to demonstrate their claims during the Mining Congress, at their plant, and arrangements can be made at their city office, 718 Broadway Central building.

CATALOGUES RECEIVED

THE SIMS CO., Erie, Pennsylvania. 'Power Plant Appliances.' A series of bulletins. Illustrated. 6 by 9 inches.

NATIONAL BRAKE & ELECTRIC CO., Milwaukee, Wis. Publication No. 391. 'Air Compressors.' Illustrated. 68 pages. 6 by 9 inches.

THE BONNOT CO., Canton, Ohio. Bulletin. 'Bonnot Pulverizer for Fine Grinding by Either Wet or Dry Process.' Illustrated. 16 pages. 6 by 9 inches.

THE JEFFREY MFG. CO., Columbus, Ohio. Bulletin No. 42. 'Handling Coal and Mine Equipment.' Illustrated. 48 pages. 6 by 9 inches. Booklet No. 28. 'Conveying Machinery for Handling Stone, Sand, Gravel, Ores, etc.' Illustrated. 28 pages. 3½ by 6 inches.

EUROPEAN consumption of copper for the seven months ended July 31, 1910, is figured at 175,136 tons and was larger than for any like period for the last three years excepting 1908, when consumption amounted to 181,774 tons. Consumption in England was but a few tons less than in 1908, while in Germany—figures for which are available only for six months—it was slightly in excess of 1908. In detail the figures for the period for the past three years are as follows (in tons):

	1910.	1909.	1908.
England (7 months)	46,163	39,114	47,080
France (7 months)	32,587	34,758	36,933
Germany (6 months)	79,447	77,919	79,090
Other countries (7 months)	16,939	17,890	18,671
Total	175,136	169,681	181,774

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EDITORIAL

A pleasing evidence of journalistic enterprise is found in the special edition of the *Los Angeles Mining Review* issued during the session of the Mining Congress.

THE proceedings of the American Mining Congress now in session at Los Angeles are of unusual interest and will be reported in full in the issue of October 8.

SCHIEFTELS & CO., Broad street, New York, brokers were raided by the Federal authorities on the morning of the 29th ult. for conducting a 'bucket-shop' business. All of their offices in other cities were likewise simultaneously raided, according to a late special despatch to the *Mining and Scientific Press*.

ON the Comstock Lode at Virginia City, Nevada, reports of new development in the deep levels of some of the central mines are of encouraging nature. Indications are that large bodies of ore may be found in hitherto unexpected places, at and near the contact of the great diabase dike with the hanging wall andesite.

THE importance of the mineral industry in the Joplin region of southwestern Missouri is not generally realized throughout the mining regions of the West. The monthly output of zinc and lead ores from that part of the country is at present at the rate of nearly $15,000,000 annually, not by any means an unimportant contribution to the aggregate output of the United States.

PAPUA, or New Guinea, is the latest country to threaten additions to the troubles of those who would control the copper output. Lodes 20 to 90 feet wide consisting of soft sulphide ore assaying 8 to 30 per cent copper are reported and one operator on the Laloki river cleared $10,000 in six months, when the grade having fallen to 8 per cent, it no longer paid to ship the ore.

MEXICO celebrated most enthusiastically the close of her first century as an independent nation and the whole family of nations was glad to extend hearty congratulations and good wishes, for the Mexican government has been happy in its conduct of foreign as well as internal affairs. An excellent account of the *fiesta* as well as an elaborate summary of the resources of, and present conditions in, the country is given in the anniversary number of the *Mexican Herald*. One interesting and noteworthy in-

cident of the celebration was the founding of a National university. Mexico already had many excellent schools but, like the United States, heretofore lacked a great central university to crown the system. While conditions in the two countries differ materially, it is far from certain that we would not do well to follow in this the example of our southern neighbor.

INCREASING activity in drift mining enterprises in California is noticeable, particularly in the northern counties of the State where there are hundreds of miles of ancient gold-bearing rivers that are still intact and of which little is known, further than that they are there. Mines of this description usually require less capital for their equipment than quartz mines, and some of the most profitable ones of the State have been of this kind.

DULL documents tell but half the story of geological survey life, and for the benefit of the younger generation who should know how the men they now admire as leaders got their start, we picture this week something of the other half of the story. The scenes of life on the Second Geological Survey of Kentucky are typical; the exceptional thing is that an artist was at hand to so faithfully present them. If any of the members of the party or their friends think such intimate scenes not proper to publish, we can only say, as did the Editor of the improper number of *Life*: "You should see what we haven't published."

IN this issue we publish the third and concluding article of a series on slime treatment by Mr. Edwin A. Sperry. The material embodied in these articles was originally used by Mr. Sperry in lectures at the Colorado School of Mines. Later, in a slightly different form, it was published in the *Western Chemist and Metallurgist*, the attractive monthly journal of the Western Association of Technical Chemists and Metallurgists. Acknowledgment should have been made to this Society with the first rather than the last of the series but was inadvertently omitted. This lively little Society has so many good things to its credit that it can well afford to be generous. Mr. Sperry has admirably treated the problems of slime concentration, supplying that broad review of the general field which from time to time affords the best basis for advance. In connection with his articles the recently issued bulletin of the Geological Survey in which Mr. H. E. Ashley has discussed the properties of colloids, may be read with interest. Our readers will remember Mr. Ashley's illuminating article on the subject that we published last year.

GEOLOGICAL SURVEYS have so far been conducted by the several States in Australia. It is now proposed to organize a Federal survey to study the resources of the Commonwealth as a whole and the arguments for and against the proposal are reviewed in *The Australian Mining Standard*. It is entirely true, as pointed out by Mr. E. J. Dunn, director of the Geological Survey of Victoria, that the expense of the work would fall on the richer States out of proportion to their area. The excellent work already done by existing organizations is well recognized abroad as well as in Australia and as Mr. Dunn points out, Victoria is abundantly able to complete the work within her own borders. The matter will doubtless be settled to the satisfaction of the Australians, the ones most concerned, but we will be pardoned, we hope, for suggesting that in America, where somewhat similar conditions have obtained, the United States Geological Survey has abundantly justified its existence entirely aside from the enhancement of the value of the public lands, resulting from its work. It is quite true that the Eastern States have furnished most of the money while the surveys have been mainly carried on in the West. Development of the West, however, has been of the largest possible and most direct financial benefit to the Eastern States and people. No one doubts that in the unsurveyed and even unexplored parts of Australia great resources lie dormant. Their development would help every State in the Commonwealth and a rich, populous, and prosperous Australia would make for the greater peace of the world. It is always true that the States and territories that most need geological surveys are least prepared financially, to conduct them, and in America we have found it an excellent plan for each State to maintain such organization as its funds would permit and for the Federal government to supplement the work of the State officers without much regard to political boundaries. The scientific problems of geology are continental and on their solution must rest all local studies. In the nature of the matter therefore, as well as in its economies, there is a reason for the larger organization.

Mine Inspection

One of the most important matters that will be presented to the American Mining Congress at its session this week in Los Angeles, will be the report of the committee on the prevention of mine accidents and the adoption of a uniform code of mining laws. Elsewhere herein will be found an outline of the legislation suggested. That the report has been prepared only after the exercise of unusual care is evident. Not only did the committee investigate the mining laws of the several States, but they also studied those of foreign countries. The effect of the operation of the laws was also studied. The draft of the proposed law is necessarily tentative. It is offered as a suggestion, or rather as a model along the lines of which the several States may each formulate their own laws governing the equipment and operation of mines. It will inevitably be criticised as being too comprehensive and too complex but for the purpose in view, education of the public and stimulation of interest, comprehensiveness is not a fault. It is well, also, to remember that the subject itself is complex and the difficulties can not be solved by a 'simple rule of three.'

All of the Western mining States have mining laws, and some of them have official mine inspectors, but there is entire lack of uniformity, and in some of the States laws for the protection of the working min-

ers are conspicuous by their absence, or, if appearing at all on the statute books only nominal penalties, or none at all, are provided for their infraction. During its investigation of this important matter the committee had figures prepared by an expert statistician, showing the fatalities in metal mining in the United States, and these figures indicate that the loss of life in metal mines is at least as large as in collieries. As the investigation covered only those States having the best systems of mine inspection, and where, in consequence, the fatal accidents were probably less numerous than where there are neither inspectors nor protective legislation, the real number of accidents is probably greater in metal than in coal mines. For various reasons many mine owners and operators are opposed to mine inspection. Ordinarily the objection to the employment of an inspector by the State is represented to be purely commercial in its character that the more or less frequent visits of the inspector, or his deputies, permit a knowledge of the extent and value of ore reserves to become public, to the disadvantage of the mine owners. This excuse, however, is seldom, or never the real cause of opposition. The actual reason for objection to a mine inspector, or to a code of laws demanding safe working conditions in mines under severe penalties, is found in the increased cost of production under these conditions. The proposed law contains no provision to which legitimate objection can be raised, notwithstanding that an exact observance of its requirements would, at some mines, result in a direct increase in expense. Furthermore, when the matter is considered in its broader light, it will be found in nearly every instance, that where increased expense would result from compliance with the law, there is a compensating advantage in the larger economy of mine operation under the imposed conditions. Take the matter of mine maps, for instance. Any mine too poor to pay for the necessary surveying and accurate mapping of its workings were better closed forever. There are many mines operated without the aid of mine maps, and frequently operations in such mines are suspended, the property is flooded with water, and remains idle for years. Should it become desirable to reopen such a mine, correct maps of the old workings would have a value far in excess of their cost. There are scores of examples of the great expense resulting from the failure to provide maps of the mine workings when they were accessible. In the matter of explosives, also, it may be noted that seldom, if ever, has it been really economical to store large quantities of high explosives in mine workings. There are too many instances of accidental explosions of underground magazines. The proposed law seeks to stop such underground storage; which is a humane and businesslike move. Some mine managers believe in getting all the wear possible out of a winding rope, but it is rare that hoisting ropes are continued in service after they are known to have outlived their usefulness, and to be no longer safe. Those accidents due to breakage of ropes are more commonly caused by over-winding, or jamming of the cage, or skip, in the shaft, though occasionally breakage results directly from deterioration of the rope and this can, in a great measure be obviated by competent rope inspection. There is not a uniform code of mine bell signals, though the advantage of having such code is obvious. One of the most important provisions in the proposed code is that requiring two openings connecting the main workings with the surface. There are large and profitable mines in the Western States having only a single shaft, or reached through one adit, or main gangway, notwithstanding that there are, as suggested by the committee, laws on the statute books requiring two openings. The fact that the State laws make this requirement is entirely without effect in the absence of a mine inspector, as no other person will take the initiative in enforcement of the law. The sinking of shafts and driving of adits is expensive, and there are those who consider one adit, or one shaft sufficient for all practical purposes, and only are willing to sink or drive another when required by the increased output of the mine. It is far from certain, however, but that even the extraordinary expense of a second opening, connecting the main workings with the surface, is a benefit rather than an unnecessary and enforced extravagance. In deep mines which are provided with but one shaft, the ventilation is notoriously bad. A second shaft connecting by the various level workings with the original opening would work a wonderful improvement in the ventilation, with a corresponding increase in the efficiency of the workmen, and in a mine employing 100 men, or more, underground, an increase of as little as 10 per cent in the efficiency of the mining force would in a few years more than cover the expense of an additional shaft, giving no consideration whatever to the advantage such shaft would possess as a means of escape in the event of an accident.

There is an existing and constantly growing sentiment in favor of a code of mining laws for metal mines which shall more completely safeguard the health and lives of miners underground, notwithstanding that many mine managers object, and have actively opposed every attempt to pass such a code of laws, or to the appointment of mine inspectors, in some of the Western States. We appreciate that the changes proposed will involve expense and may be disastrous at first to many legitimate enterprises. We believe though in inspection, as indeed do all thoughtful operators who are convinced that honest and fair inspection is possible. To assure such inspection should be the first concern of all interested in the mining industry and it may be remarked that experience elsewhere has shown that when the operators make no move toward establishment of a proper mine inspection service, the men sooner or later secure the enactment of a law with some such absurdity as in Oklahoma where the Inspector is an elected officer. In Arizona a commission was appointed that thoroughly studied the matter and recommended an excellent code. This seems to us a sensible method of approach. To such a commission the report of this committee would be of the highest utility, and to the general mining public it will be informing and educational.

Concentration of Slime—III

By Edwin A. Sperry

(Continued From Page 411)

FINAL TREATMENT

It is with some delicacy that the subject of the final treatment of slime is approached, as there will appear in the discussion many facts which may be taken as an argument in the defense of the slime concentrating table which bears my name.

The line I shall take up will be, as nearly as possible, the abstract discussion of the principles involved in the construction and operation of various forms of concentrators used for this special purpose and the comparison of them from a practical as well as from a technical point of view. The purpose is to briefly review the previous statements and take up a few of the salient points, the more clearly to demonstrate the vital necessity of proper preparation of the pulp before concentration is attempted. The advantage of using the spitzkasten for the purpose of preparation has been emphasized already. An attempt was made to show the various actions of settling, classification, partial concentration, and dewatering which are carried on simultaneously, as well as the special value of each in the proper preparation of the pulp for its final treatment. In comparison, instances were given in which, by the use of canvas tables, these advantageous results were not only in a measure lost, but that other conditions resulted that tended to endanger if not entirely prohibit good results in the final treatment. Another point emphasized was, that in any current whatsoever, losses are sustained. This radical statement was modified to the extent of an admission that in a very slow forward movement of a large body of water, a settling action is promoted that more than compensates for the slight loss which is inevitable.

Still another point dwelt on was that in the final treatment of slime, and it might also be added, in any process of concentration in which water is used as a conveying medium, the greatest possible consistency should be given to the pulp, compatible with complete stratification. In some characters of ore this consistency may be made greater than in others. For instance, clayey or porphyritic ores cannot be properly stratified at as high a consistency as can ores of a quartzose nature. While the former should not exceed 15 to 18% solid consistency, the latter may reach as high as 25 or even 30 in some cases. The point must be determined by experiment and no fixed rule can be laid down. In the discussion of the various forms of machines used for the purpose of slime concentration, one radical point has been assumed. This is that as a slime particle has very little or no ponderosity, any table or machine that depends on propelling these very minute particles across its surface by the aid of their inertia through using a bump, a reciprocating motion, or any similar method, cannot, from the nature of things, be classed as a slime table. The surface itself should have a continuous progressive movement conveying the pulp, which rests motionless upon it, through the various stages of stratification, washing, separation, and final cleaning of the surface. This is in direct compliance with the principle that in handling slime all disturbances must be most strictly avoided. It might seem inconsistent to state at this point that a vanning motion of some kind can be applied to the surface with a decided advantage to the results, both as to capacity and to efficiency. This seeming contradiction, however, can be readily harmonized by the statement that as soon as the slime particles are deprived of their liberty of action and are hemmed in and jostled by their neighbors they have less of an inclination to escape. In other words, when the pulp is dewatered to a high percentage of consistency, this very consistency, in direct proportion to its degree, allows of agitation without loss. It is because of this fact that in final treatment, the greatest possible consistency compatible to perfect stratification should be given to the pulp. However, even with high consistencies, a too violent disturbance should be avoided. Just enough motion should be given to keep the pulp 'alive' and give it an opportunity to stratify but not enough to mix it. This is a point which is so often lost sight of by some who think that "if a little is good more is better." The character and effect of different forms of motion will be taken up under the proper head.

There are three radical types of tables used for the purpose of concentrating slime, classified as follows: (1) the conical buddle, (2) the end-moving belt, (3) the side-moving belt. In the first can be placed the Evans, the Roberts, the Cornish, and the Sperry buddles; in the second the Frue, the Embry, the Golden Gate, and the Johnston vanners; in the third the Luhrig, the Monell, the McCoy, and the Roberts slime belts. There are a number of modifications and combinations of these types, for instance, in the A. & E. slime table which, having features common to two or more of them, can hardly be classed as one of radical type. In the discussion and comparison of the several forms of machines the subjects will be divided into: (1) the general forms, (2) the character of the different pulp distributions, (3) the efficiency of the different forms of motion and degree of consistency of the pulp, (4) the character of the separation on the different forms of machines, (5) the character of the products, (6) capacity, (7) efficiencies, (8) general discussion. In these comparisons typical machines will be selected: (1) the buddle, to which a circular vanning motion has been recently applied; (2) the Frue vanner, which is too well known to need any description; (3) the Luhrig belt machine, which was one of the original machines to adopt the side-moving belt. In referring to them only simple mention will be made.

(1) **General Form.**—The buddle is a low conical table, circular in form, with a surface which slopes uniformly from the centre to all points of its edge. It revolves slowly on its centre and has a quick circular vanning motion in an opposite direction to its revolution. The vanner is an endless belt, having a surface oblong in form, with a uniform slope in line with the greater dimension. It has a slow uniform progressive motion in line with its greater dimen-

sion, from the lower to the higher end and a quick uniform reciprocating motion transverse to the slow progressive motion. The Luhrig is an endless belt having a surface oblong in form with a uniform slope transverse to its greater dimension. It has a slow intermittent progressive motion in line with its greater dimension which is supplemented with a slight knock or bump to assist in action of stratification.

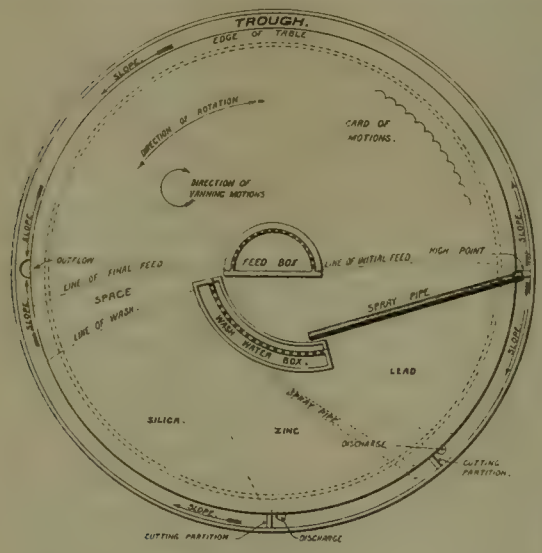
2. **Character of Pulp Distribution.**—On the buddle the pulp is delivered at the centre and assumes a fan shape which in broadening, naturally decreases the depth of the flow, thereby retarding its speed. On the vanner the pulp is applied across its entire width near the higher and flows uniformly to the lower end. The sectional area being uniform at all points of the flow, its speed is practically uniform, with possibly a slight acceleration near the lower end. On the Luhrig the pulp is applied at the upper edge of the belt near the end from which it moves and flows across it, assuming slightly a fan shape. In comparison, the fan-shaped flow and the consequent retarding of the speed, is obviously of advantage in the arresting of the slime particles, giving them more chance to settle to the surface of the belt.

(3) **Efficiency of the Different Forms of Motion and Degrees of Consistency.**—A number of tests have been conducted to ascertain the relative efficiency of the circular as compared with the simple reciprocating motion, as regards the degree of pulp consistency possible for the most satisfactory results. In every case it was found that the circular motion was capable of stratifying pulp of nearly twice the consistency of that which could be properly treated by the simple reciprocating motion. To be more exact, while the pulp fed to the vanner contained, on an average, 15% solids, that fed to the buddle carried 25%. In each case the consistency was about at the normal. With the Luhrig a much higher consistency can be maintained than on the vanner. The buddle and Luhrig more closely resemble each other in this regard. To explain: the pulp as it is fed on the vanner, across its width near the upper end, flows directly to the tail of the machine. This feed being continuous, the pulp must be sufficiently dilute to flow freely and not cake. During the flow from one end to the other the reciprocating motion of the machine is depended upon to stratify the pulp and bring the mineral particles in contact with the belt surface. These, by the travel of the belt, are carried back, up the slope of the surface directly in the face of the flow and passing over the upper or head end of the machine, are washed off into their proper receptacle. In the case of the buddle as well as of the Luhrig, the pulp is fed on the surface at the highest point. As it flows out on the surface it is spread out, and, in the case of the buddle, is allowed to rest. In the Luhrig it has not the same degree of opportunity to stop in its course, but certainly is not compelled to battle against a current moving in a direction opposite to the motion of the surface. After the pulp has been thus distributed, on the buddle as well as on the Luhrig, it is conveyed from the zone of feed flow and, by the motion of the surface itself, is passed through the various stages of operation as before stated. As the flow of pulp on these two machines can be retarded to advantage, it is self evident that the degree of consistency is only limited by the efficiency of the motion employed for the purpose of stratification.

4. **Character of the Separation in the Different Forms.**—Owing to the form of the vanner, the separation of the mineral from the gangue is largely regulated by the application of the washing water, assisted by the use of some of the mechanical adjustments. As there are two separate points of discharge, the head and tail, the products are therefore either concentrate or tailing, without any possibility of intermediate grades. With both the buddle and the Luhrig all discharges are made over one continuous edge. The tailing near the lower edge is first discarded, after which the mineral or concentrate is washed off. In some cases the distinction between the two products is well marked, but ordinarily there is some merging. As a result of these conditions the possibility of cutting out various products is denied the vanner, while on the buddle and the Luhrig such divisions are readily made. While it must be admitted that the tendency toward merging prevents clean separation, especially when two minerals such as lead and zinc sulphides are being treated, still the possibility of cutting out as middling that portion included in the zone of merging, for the purpose of re-treatment, more than compensates. In this manner clean products can be obtained. In one case where a separation between pyrite and silica was made, a clean concentrate was cut out on the buddle. A middling product was also cut out between the concentrate and the tailing which was returned to the circuit and handled with the original pulp on the same machine. The product obtained ran 34% iron and 6½ silica, as against 29 iron and 18 silica in the product obtained from the other tables. These results total each in iron, sulphur, and silica 88% approximately, which indicates that there was some other element present, presumably zinc, in the form of sulphide. This advantage cannot be lightly passed over.

(5) **Character of the Products.**—This particular feature has been given considerable study and in its analysis, the particular claim of any machine, as to its being especially adapted to the concentration of slime, can be readily established or disproved. In all ores treated by concentration the mineral particles between 100 and 200 mesh will almost invariably vary in value from those which will pass a 200 mesh. In some cases it has been found that the finer size was higher in grade; occasionally the reverse is true. In one case in a slime carrying copper, the fine mineral particles were much lower in value than the coarse. In this case a buddle was being operated in a competitive test beside the vanner. By careful examination the following conditions were found to exist: the product from the buddle contained a large proportion of slime mineral; the silica content was practically the same in both products; a larger quantity by weight was produced by the buddle; the product of the vanner ran 23% copper

as against 18 in the product from the buddle; the total copper was greater from the buddle; and finally, the tailing from the buddle ran noticeably lower than that from the vanner. Analyzing the conditions, it is clear that the presence of a larger proportion of slimed mineral in the buddle product, which at the same time ran lower in copper and practically the same in silica, indicated that the finest of the mineral was lower in grade than the coarser; the fact that the tailing from the buddle ran less in copper than that from the vanner indicated that the buddle made a closer saving, and this, coupled with the facts that the quantity of concentrate was larger from the buddle and contained a larger proportion of the slimed mineral, proved conclusively that the buddle was a better slime saver than the vanner. There are several lines of deduction which might be reasoned out, but these are sufficient to make clear the first statement, that a study of the character of



Sperry Slime Table

the products will readily prove or disprove the claim made for any machine as to its qualities as a slime concentrator.

(6) **Capacities.**—In the matter of capacity the types can be named in the following order, based on each foot of width: (1) the buddle, (2) the Luhrig, (3) the vanner. From experience with the three types the following figures of capacity have been deduced. They may be safely used for approximations: for the buddle, with a circular vanning motion, from 2 to 3 tons for each foot of radius; for the Luhrig, 1½ to 2 tons for each foot in width, and for the vanner, 1 to 1½ tons for each foot in width. These are all based on 24 hours running. This would give a 10-ft. buddle from 10 to 15 tons, a 3-ft. Luhrig from 4½ to 6 tons, and a 6-ft. vanner from 6 to 9 tons in 24 hours. The original Luhrig tables had belts 3 ft. wide, and it is fair to suppose that an increased capacity could be obtained by using a wider belt. The Wilfley slime table, which is a combination of the Luhrig and the vanner, has a much greater width, though the capacity is not increased proportionately. In analysis of conditions we can find a cause for these varying capacities. It will be noted that they are about in direct proportion to the normal consistencies of the pulp, as discussed under that head.

(7) **Efficiencies.**—A few statements of results of actual work as practical illustrations of some of the previous statements are here given. In one case, where the three typical machines were operating, the results were as follows. The buddle had a capacity of 10 tons, consistency 25% solids, concentrate 34% iron, 6½ silica, tailing trace in gold. The vanner had a capacity of 6 tons, consistency 15% solids, concentrate 33% iron, 10 silica, tailing 0.02 oz. gold. The Luhrig type, 6 tons capacity, concentrate 29% iron, 18 silica, tailing 0.01 oz. gold. In another case the buddle had 12 tons capacity, 25% solids, concentrate 47% lead, extraction 67%. The vanner 6 tons capacity, 14% solids, lead 55%, with 39% extraction.

(8) **General Discussion.**—The question may arise as to what might constitute a proper amount of motion. As the result of a number of experiments it is thoroughly determined that in properly stratifying slime pulp, 300 inches of motion per minute is the maximum and that should only be used, either when heavy or clayey gangue is to be separated from a heavy mineral, or when two minerals are to be separated from one another. It is ordinarily the case that over 200 inches per minute are used. In the vanner, for instance, 200 revolutions of the shaft is an average speed. With this speed the throw is from ½ to ⅝ in., making from 1 to 1¼ in. per complete revolution, giving from 200 to 225 inches per minute. In the buddle with ¼-in. circle of motion, 300 r.p.m. would give 235 in. per minute. With ⅜-in. circle at 250 r.p.m. would give 281 in. per minute. These sizes and speeds have been shown to include those giving the most favorable results, and so it can be stated that between 200 and 300 in. per minute will be found a speed which, in almost every instance, will meet the requirements.

In discussing these three types, only such forms have been taken up as might be considered as most commonly used, and what might be called standard or representative. There is another form which might be considered as a fundamental type. It is that using the principle of the pan. This has never proved satisfactory or practicable, as it has never been made automatic and continuous. It was employed in the Copeland table some years ago, but was not successful. The A. & E. slime table, recently introduced, seems to be the most practical application of this principle. This is a combination of the pan and the Luhrig. It certainly presents interesting features. The Wilfley slime-table is constructed on the general form of the Luhrig. So much so, in fact, that it has been considered as a form of this type. It has some features, however, which put it at variance with the Luhrig. The up-throw of the motion, the use of transverse trays, and the method of delivery of the concentrate give it some resemblance to the vanner. With the motion, the tendency is to throw the mineral to the upper ends of the trays against the ascending current.

Early Geological Surveying in Kentucky

By H. Foster Bain

From the time when Rafinesque in 1824, "in only 26 duodecimo pages gave the geological, ethnological, and historical annals of Kentucky from the first day of creation according to Moses, down to the current year," geology has received much attention at the hands of Kentuckians. Geologists even form part of the background of the literature of the 'Blue Grass' State and 'Reynolds of the Geological Corps' is, at least, as important a member of the table group whose conversation John Fox repeats for us, as is the gentleman who contributes to the uplift of the drama by 'carrying a spear in the third act' of the latest Broadway musical extravaganza. Even better claims, however, may be urged for Kentucky

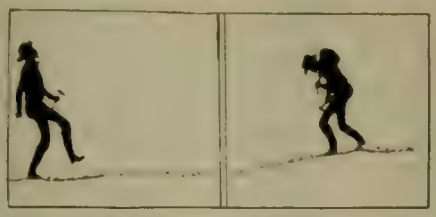


Fig. 1.—7 A. M. Leaving Camp. 7 P. M. Returning Home.

geologists. From 1854 to 1860, the last six years of the life of that pioneer American scientist, David Dale Owen, were spent in organizing and directing the work of the first Geological Survey of Kentucky. With Robert Peter, Sidney T. Lyon, Leo Lesquereux, E. T. Cox, and Joseph Lesley on the staff, it is no wonder that the reports of this early survey are

Fig. 2. U. S. Coast Survey Hunting the Coast.

greatly in demand and largely used today. Beginning in 1860, Kentucky had troublous times, and the attention of its officials and citizens was perforce directed to other things than the cultivation of science. By 1873, conditions were again normal and the need of a more complete investigation of the natural resources of the Commonwealth was felt. Accordingly, a second geological survey was organized. It continued active until 1891 and after an interim was succeeded by the present Kentucky Geological Survey of which C. J. Norwood, himself a son of J. G. Norwood, the pioneer State geologist of Illinois, is the director. The survey organized in 1873 was placed in charge of Nathaniel Southgate Shaler, then professor of paleontology at Harvard College, and long and familiarly known to all Kentuckians as 'Professor Nat.' Shaler must always be considered one of the great figures of American geology. Entirely aside from his scientific work he

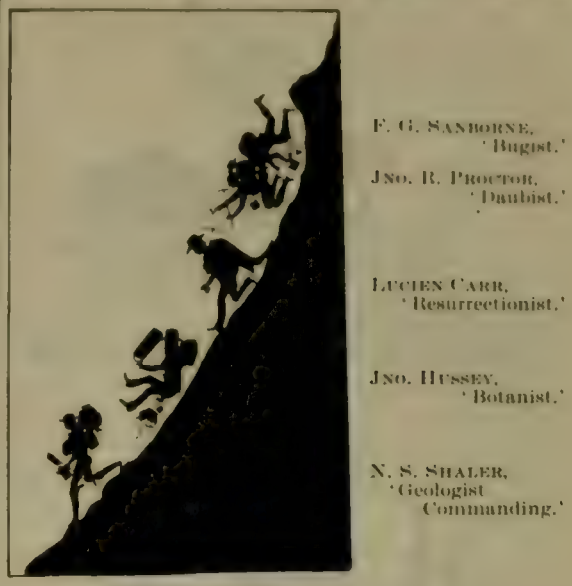


Fig. 3. Moving Camp into 'the Gulf.'

was a man of enormous influence. Through his writings and his work as a teacher at Harvard both before and after his service in his home State, he did much to popularize his favorite science. The indirect influence both on him and on the country of his seven years' official work in Kentucky is difficult to estimate, though undoubtedly large.

Gathering about him a brilliant staff of young men, who in turn became leaders in many lines of professional work, Shaler promptly took the field and began work. The party included A. R. Crandall, P. N. Moore, C. J. Norwood, and J. R. Proctor, as assistant geologists, while Robert Peter had charge of the chemical laboratory. Attached to the geological party were John Hussey, botanist; F. G. Sanborne, entomologist; Lucien Carr, archeologist; W. B. Page and W. W. Beckham, topographers; W. T. Page, flagman; and last, though far from least, big, fat, good-natured Sam Tutt, the cook. For cooks were essential to geological survey work in those days, even in Kentucky. Then, geologists did not travel in Pullman cars, and swift automobiles had not yet made it possible to keep headquarters at the county seat. Indeed hotels were few and far be-

Fig. 4. Getting up Steam.

tween, and most travelers who experienced such as existed were satisfied that they should remain so. Camp life was a necessity in such work. In these degenerate days a race of geologists is coming on that knows nothing of packing, field assistants that

Fig. 5. He Wanted "To See the Mule He Couldn't Drive." He Did.

could not make camp without help, and have never tossed flapjacks high in the air!

Travel and its vicissitudes formed a large part of the daily life of the early geologist. In the sketches presented herewith are scenes that will re-

Fig. 6. Enjoying the Hospitality of the Country.

call old times to many. The reproductions are from silhouettes made at the time by John R. Proctor and carefully treasured since by members of the party. They are published here by the courtesy of Philip N. Moore. Proctor, who succeeded his chief

Fig. 7. Showing a Native the Wonders of Entomology.

as director of the survey and later was called to Washington by Cleveland to become a member of the United States Civil Service Commission, came to look on these little pictures as *infra dig* and in after years neglected what was evidently an especial talent. He would doubtless have been a great cartoonist; but in pre-McCutcheon days making cartoons was not so highly esteemed as a method of molding public opinion as now, nor, it may be added, was skill in that direction so well paid for.

In the first figure the artist has represented the contrast between 7 a. m. and 7 p. m. The geologist is evidently in high spirits when he leaves camp, but by evening the day's work has taken its toll and with his heavy bag of rock he trudges wearily home

Fig. 8. Taking a Sight.

to a late supper. The topographers had their own troubles with transportation as is shown in the second drawing which is variously called 'The Triangulation Party in Action' or the 'Coast Survey Hunting the Coast.' Then as now co-operation with Federal bureaus was in order, and the triangulation work was fitted into the general scheme. The valiant leader of this band of itinerants is William B. Page, whom Coloradoans will recognize by this work in engineering if not by the picture. Following him is W. W. Beckham, now dead, a brother of the recent Governor of Kentucky. (It some way comes natural to mention family connections in writing of Kentuck-

Fig. 9. The Topographer Invents a New Cot Weighing Only 8 Pounds.

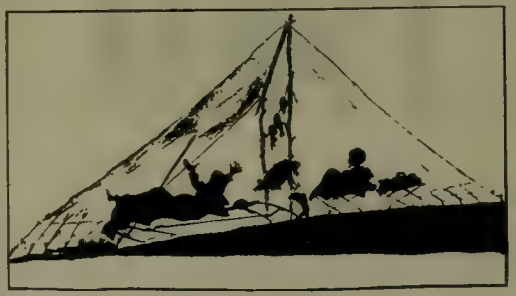


Fig. 10. He Decides to Only Warrant It on Level Ground.

ians.) In the youth carrying the flag at the rear, probably no one will recognize Walter T. Page, now a most dignified director of the American Smelting & Refining Co., and long manager of the Omaha works. He has moved up toward the head of the procession since those days. The name of the fourth member of the party has not been preserved.

Moving camp is always a great event and some-

times involves much difficulty. In the third, fourth, and fifth pictures some early problems in transportation are illustrated. In the first (Fig. 4) the line of march includes, N. S. Shaler, geologist commanding; John Hussey, botanist; Lucien Carr, 'resurrectionist'; John R. Proctor, who modestly labels himself 'dauber'; F. G. Sanborne, the 'bugist' who is helping Proctor along. As the topographers were evidently not with the party at this time we may reserve some doubts as to the accuracy with which the slope has been taken. In Fig. 4, it is evident that the team has balked and the combined efforts of the party have so far proved unavailing. The chief is represented as resorting to the traditional expedient of building a fire under the recalcitrant animal. If it were not for the picture I would doubt this part of the story. In the next quite a different tale may be read. The gentleman who is bracing himself so firmly against the frail dash board is

Fig. 11. The Professor Decides to Sleep Higher Off the Ground.

Fig. 12. He Miscalculated the Strength of His Materials.

Philip N. Moore, now the well known consulting engineer in St. Louis, but then beginning as mineralogist of the party. It is said that he carelessly expressed a desire "to see the mule he couldn't drive" and his friends accommodatingly arranged to grant his wish, as a pleasant little surprise.

The natives and their ways form the motif of a number of Proctor's sketches. The mountaineers of east Kentucky are everywhere known as a poor but exceedingly hospitable people. Occasionally this leads to their undoing as in Fig. 6. In this case a hungry geologist, having been invited in for a meal, has eaten an amount that those knowing the present director of the Kentucky Geological Survey would not anticipate, as is shown by the remark of the man of the house: "I declare mister, you've got the powerfulest appetite I ever seen. You've eat up all wee 'uns dinner." In justice to the visitor it must be said that he had no notion that the dinner had been cooked for the whole family. Occasionally, visitors came to the survey camp and then every effort was made to return courtesies. The favorite method of entertainment was to set up a microscope on some convenient stump and show the caller something of the wonders of entomology (Fig. 7). Sanborne was always good at this and would lecture for hours to admiring and awestruck adventurers. Encounters on the road were numerous and occasionally embarrassing, as in Fig. 8, where the mule is

Fig. 13. Nightmare in Camp.

anxiously eyeing Page's theodolite while the fair lady on his back says: "I say, mister, will that thing shoot? Take it away. It skeers my critter."

Trouble follows the surveyor even to his bed as is shown in Fig. 9 and 10. In the first the topographer, Page, is explaining to the admiring artist the construction of his newly invented bed which "only weighs eight pounds." In the second scene the bed is shown in action, and the topographer decides that he will only undertake to warrant it on level ground. The spirit of invention having broken loose Sanborne tried his hand, deciding, as shown in Fig. 11, to swing his bed higher from the ground. Unfortunately, as revealed in the next figure, he

Fig. 14. Home Again—3 A. M.

was but a careless scientist and neglected to calculate the strength of his materials. High beds would evidently have been of advantage as indicated by the thirteenth picture which proves the substantial nature of the night mares that visited the camp.

Even the longest field season comes finally to an end and the geologist goes home to renew acquaintance with his family. In Fig. 14 is shown a touching family scene where at 3 a. m. the weary surveyor has about decided that after all camp life was not so bad.

Uniform Mining Laws

*The committee on Uniform Mining Laws appointed by the American Mining Congress at its Denver meeting in 1906, has completed its labors and presented its report to the Congress now in session at Los Angeles. The members of this responsible committee were Walter Renton Ingalls, chairman; J. Parke Channing, James Douglas, James R. Finlay, and John Hays Hammond. The object of the appointment was the drafting of a code of laws regulating the operation of coal and metalliferous mines which might serve as a model in all of the mining States. It has been felt that if adoption of a uniform law could be brought about it would reduce the number of accidents in mines. The report of the committee and the draft of the proposed law are presented in abstract below.

Since its appointment, the committee has had under continuous consideration the matter with which it was charged. At the meetings of the American Mining Congress in 1907, 1908, and 1909, it reported progress. At the meeting in 1909 it was authorized to present its report not only to the American Mining Congress, but also to the American Institute of Mining Engineers and the Mining and Metallurgical Society of America, and to present its report in printed form during the interim between meetings of the American Mining Congress. The committee collected from State officials copies of their mining laws. With the assistance of *The Engineering and Mining Journal*, copies of the laws of Great Britain, the Transvaal, New South Wales, Victoria, Queensland, Western Australia, Tasmania, New Zealand, and certain European countries were also obtained. These laws were subjected to careful study. Upon the basis of the existing laws of the States, of Great Britain and the English speaking colonies, a tentative draft was prepared and printed in limited number in 1909, for convenience in securing the advice and criticism of a considerable number of persons engaged in the mining industry. At the request of the chairman of this committee, Frederick L. Hoffman, statistician of the Prudential Insurance Co., summarized and reviewed the available statistics of fatalities in metalliferous mining in the United States. From only six States has it been possible to secure statistics extending over a long series of years. The other States do not report them. The probability is, however, that the actual ratio of fatal accidents in metal mining is larger than the figures reported by Mr. Hoffman, because his figure is based chiefly upon the States which have provided the best mining laws and the best systems of mine inspection. The good of these things is clearly shown by the statistics. Thus, in Colorado and Montana, which among the Western States are conceded to have the best laws, the general tendency of the fatality ratio has been downward. Mr. Hoffman clearly established something that has been strongly suspected, namely, that the loss of life in metal mining in the United States is fully as great as in coal mining. Mr. Hoffman has arrived at the average of 3.09 per 1000 in metal mining, as compared with 3.13 in coal mining.

The chief work of the committee has been in the preparation of a draft for a law. In this work it has invited and received the assistance of several members of the bar, especially Dr. Rossiter W. Raymond, E. E. Ellinwood, and Archibald Douglas. To the valuable co-operation of Mr. Douglas, who devoted a great deal of time to the matter, particular acknowledgment is due. Mr. Douglas prepared the draft for a law finally adopted by the committee. In the preparation of this draft, the committee has had in mind the preparation of a law that will be effective, and not merely a code of rules and regulations of which the enforcement will be largely optional. The committee has aimed to fix responsibility upon operator, superintendent, foreman, and miner respectively, and the failure on their part to comply with the terms of the law is to be punishable by suitable penalties. The conditions of mining in various parts of the United States are widely different. The basic laws of the several States also differ to more or less extent. Consequently, the committee presents its present draft as a preliminary and invites criticism for its assistance in preparing a final report.

In the opinion of the committee, the essential steps toward reducing the loss of life in metalliferous mining are (1) a comprehensive and effective law; and (2) an adequate system of mine inspection. The latter is the keystone of progress. Much can be accomplished by an adequate system of mine inspection, even if a comprehensive law be lacking, but no matter how thorough and effective in theory a law may be, it will fail in its purpose unless provision be made for its sincere, impartial, and positive enforcement by an adequate system of competent mine inspection. To secure such a system of mine inspection, the States must appropriate a good deal more money than any has yet done. Each State must have a mine inspector, and he must be provided with a sufficient number of deputies to enable frequent inspections of all operating mines to be made. One inspection of a mine in a year is not enough. So far as we are aware, the State of Colorado makes the largest appropriation for inspection of metal mines, its appropriation being $25,000 per year. Other important mining States appropriate only $10,000. In the opinion of the committee, such appropriations are utterly inadequate. We operate in this country at a more intense rate than in many foreign countries, and perhaps our death rate per tonnage of ore produced per man would not compare so unfavorably, and because of this more intense operation it may be impossible for us to attain the low rate of some foreign countries. It must be borne in mind that it is not only underground but also overground that accidents are more numerous in this country than in Europe. There is a spirit of recklessness in this whole land that leads people to take risks that the European population avoids. But certainly our mining practice is capable of great improvement with respect to the safety of the miners, and the magni-

*Report of the Committee appointed by the American Mining Congress to draft a law for prevention of mine accidents.

tude of the annual loss justifies a large State expenditure for the purpose of its reduction. It is essential that mine inspection be impartial—absolutely free from all political personal or selfish interests, and moreover that it be competent. In its draft for a law, the committee has incorporated, after careful consideration, qualifications for mine inspectors, which, in its opinion, will provide the essential conditions stated above.

Section 1. Defines the terms used in the text of the law, including mine operator, superintendent, mine foreman, inspector and deputy, and excavation or workings.

Sec. 2. Office of Inspector of Mines.—The office of Inspector of Mines for the State of ———— is hereby created. The Governor of the State, by and with the advice and consent of the Senate, shall appoint such Inspector of Mines. The Inspector of Mines shall be at least 30 years of age, a citizen of the United States, a resident of this State for at least one year previous to his appointment, and shall be practically engaged in metalliferous mining, and shall have had at least 10 years' experience in underground mining in the United States of America. The Inspector of Mines (but not the Deputy Inspectors) must have been for at least five years in charge of a mine, in the United States of America, employing 50 or more men underground, to be qualified for such office. He shall receive as full compensation for his services a salary of ———— Dollars ($————) per annum. He shall hold his office for a term of four years (the first term beginning January —, 19—), unless sooner removed by the Governor, or until his successor is appointed and qualified; and in case of vacancy by death, removal, resignation or otherwise, the Governor shall fill such office, for the remainder of any such term of four years, by appointment.

Sec. 3. Deputy Inspector of Mines.—The office of Deputy Inspector is hereby created. The Inspector of Mines is authorized and directed forthwith, upon the entering of the duties of his office, to appoint ———— Deputy Inspectors, who shall each receive a salary payable at the rate of $———— per annum while holding such office. All Deputy Inspectors appointed under the provisions of this section shall be subject at any time to removal by the Inspector. The Inspector shall also appoint hereafter such additional deputies as the Legislature may provide, who shall, when so appointed by the Legislature, be in all ways subject to the provisions of this section. The qualifications of all Deputy Inspectors shall be the same as those required in the case of the Inspector of Mines, as set forth in section 2 of this Act; excepting however, that such Deputy Inspectors shall have been for two years in charge of a mine in the United States of America, employing at least 25 men underground.

Sec. 4. Qualifications and Powers of Inspectors.—No person shall be appointed to the office of Inspector or Deputy Inspector, nor be qualified to hold the office of Inspector or Deputy Inspector, while an employee, director, or officer of any mining, milling or smelting company; or while directly or indirectly connected with any mining company or co-partnership operating in this State; or while engaged in private practice as a consulting engineer. The Inspector and each deputy must devote his entire time to the duties of their respective offices.

Sec. 5. Salary and Expenses.—All reasonable and necessary expenses incurred by the Inspector and by any deputy in the performance of their duties.

Sec. 6. Inspectors Shall be Allowed all Legal Expenses.—The Inspector may employ counsel to represent him, or any deputy, or to assist in the prosecution of actions or proceedings brought under the provisions of this Act.

Sec. 7. Office and Records of Inspector of Mines.—The Inspector of Mines shall be provided with a properly furnished office in which he shall keep a record of all mines examined either by the Inspector or his deputies, showing the dates of such examinations, the condition in which the mines so examined were found, with particular reference to the safety, ventilation and sanitary conditions of each mine so examined, the manner and method of working, all violations of the provisions of this Act found, if any, the action taken thereon, and the result of such action, together with recommendations made in case of each mine examined by the Inspector or any deputy.

Sec. 8. Reports to Inspector of Mines.—It is hereby made the duty of the operator of each and every mine within the State to forward to the Inspector at his office, not later than the 20th day of January, in each year, a detailed report in writing, on a form prescribed by the Inspector, showing the character of the mine, tonnage of ore produced during the previous year, ending December 31, the average number of men therein employed during the year, the number of days the mine was worked, the number of fatal and serious accidents during the year, and such other information relative to the workings, equipment, ventilation, sanitation, means of ingress and egress, shafts, trucking, supports, safety devices, storage of explosives, means taken to protect lives and usual safety of men in relation to any of the requirements of this Act, as the Inspector may, from time to time require.

A failure, neglect or refusal to make such reports or to give such information as are provided for in this section, upon demand made in writing by the Inspector, or by any of his Deputy Inspectors, shall constitute a misdemeanor and every such operator, or persons in charge of such mine, so failing, neglecting or refusing after written demand made shall be deemed guilty of a misdemeanor, and on conviction shall be fined for each offense not less than $50 or more than $200; and each separate failure, neglect or refusal after demand, as aforesaid, shall constitute a separate offense.

Sec. 9. Designation for Service of Notices.—Every operator of any mine within the provisions of this Act, shall, within 60 days after the passage of this Act, file or cause to be filed in the principal office of the Inspector of Mines a designation, duly verified, by such operator, designating a person upon whom all notices, warnings or processes, required to be served under the provisions of this Act, may be served in this State. The person so designated must

have an office, place of employment or place of business within ten miles of the principal place of business of such operator within the State, and such designation shall give the office, place of employment or place of business of such person so designated.

Sec. 10. Secrecy of Records.—The Inspector or any Deputy Inspector, or any person employed by such Inspector or Deputy Inspector, or any person having access to the papers filed in the office of said Inspector, or in the office of any Deputy Inspector, shall not make public or reveal to any person or persons, either orally or in writing, all or any part of the contents of any report, complaint or document filed in the office of the Inspector of Mines of this State, or in the office of any of his Deputy Inspectors, or reveal or make public to any person or persons any knowledge or information in regard to the safety or physical or financial condition of any mine, mining rights, prospect or mining company or concern obtained by any of the aforesaid Inspector, Deputy Inspectors or employees, while in the exercise of their official duties.

Sec. 11. Duties of Inspectors—Inspection—Powers.—It shall be the duty of the Inspector of Mines by himself or by deputy to visit at least once every two months every mine in the State employing 50 or more men underground; and every other mine at least once every year and oftener if in his opinion the safety of the men employed within the mine so requires; and to inspect, inquire and examine into the operation, workings, timbering, safety appliances, machinery, sanitation, ventilation, means of ingress and egress, means taken to protect the lives and insure the safety of the miners, together with the cause of accidents and accidental death therein, and in general, to inspect and ascertain what means are taken to comply with the provisions of this Act.

Sec. 12. Dangerous Mines—Duties of Inspectors.—Whenever the Inspector shall find any mine in an unsafe condition by reason of any violation of any of the rules or provisions of this Act, or in a condition dangerous or detrimental to the life or health of those employed therein, for the reason or by reason of defects in timbering, mining, ventilation or sanitation, it shall be the duty of the Inspector to serve a notice in writing upon the operator of such mine, and such notice shall set forth in detail the nature and extent of the defects which render the mine or part of the mine unsafe, dangerous, or detrimental to the life or health of those employed therein, together with the point or place in the mine, or in the workings of the mine, where such defects exist, and such notice shall require such necessary changes to be made in such mine or part of the mine without delay, and within a specified time in the discretion of the Inspector, to make the same conform to the provisions of this Act.

If it appears from a re-examination of the mine by the Inspector, or a Deputy Inspector, that such necessary changes have not been made within the time specified in such notice, and that the mine or part of the mine is still in a condition dangerous to life or health, it shall be the duty of the Inspector forthwith to institute an action for an injunction in any Court of competent jurisdiction, to restrain the operation and working of said mine, or part of said mine, and the permitting of employees therein for purposes other than to remedy the defects complained of, until the provisions of this law are complied with.

Sec. 13. Refusing Inspection—Penalty.—If the operator of any mine within the State shall fail, impede or refuse to permit such inspection, as is provided in this Act, the Inspector may file affidavit setting forth such refusal before the Judge of the ———— Court in the county in which said mine is situated, and obtain an order directed to such operator, commanding him to permit and furnish all necessary facilities for the entering, examination or inspection of such mine, or to be adjudged to stand in contempt of court and punished accordingly.

Sec. 14. Records of Inspection.—It shall be the duty of the Inspector, or any deputy, after every inspection made of any mine or parts of any mine, as provided in this Act, to enter forthwith in a book to be kept at the mine, and designated as the 'Record of Inspection,' the portions of the mine so inspected, the nature of such inspection, and every illegal defect observed in the condition of the mine, machinery and appliances.

Sec. 15. Complaints to Inspectors.—Whenever the Inspector receives a complaint in writing, signed by three or more persons employed in a mine, setting forth that the mine in which they are working is being operated contrary to law, and is dangerous in any respect to the health or lives of those employed therein, the Inspector must examine such mine as soon as possible.

Sec. 16. Accidents.—Whenever a serious accident occurs in or about any mine, notice thereof shall be given promptly in writing, to the Inspector by the Superintendent or other person having immediate charge of the work at the time of the accident. Upon receiving such notice the Inspector, or a deputy, shall proceed to the scene of the accident and investigate the cause of the accident, and shall file the result of such investigation as a report in the office of the Inspector, within 20 days thereafter.

Sec. 17. Loss of Life.—Whenever loss of life occurs from accident in or about a mine, and when death results from personal injury, the Superintendent or other person having immediate charge of the work at the time of the accident shall give notice to the Inspector, promptly after knowledge of death comes. Whenever possible, the Inspector or a deputy shall be present at every coroner's inquest held over the remains of a person killed in or about a mine.

Sec. 18. Inspector to Forward Papers to Prosecuting Officer in Certain Cases.—Whenever, in the opinion of the Inspector of Mines, a serious fatal accident, in or about any mine shall have been caused by failure on the part of the operator or employee of such mine, or by any other person, to observe the provisions of this Act, it shall be the duty of such Inspector to cause a copy of the report of such accident, and all papers in his hands relating thereto, to be forwarded to the prosecuting officer of the

county, showing in what particular he believes the law to have been violated and if upon the receipt thereof the prosecuting officer of the said county deems the facts to make a prima facie cause of action against any party, he shall present such evidence to the Grand Jury and take such further steps for the criminal prosecution of such operators, employees, or other person, as may seem advisable.

Sec. 19. Statistical Reports of Mine Inspector.—It shall be the duty of the Inspector of Mines within three months after January 1st in each year, to make a report directed to the Governor and Legislature giving a statistical summary and report of the work of the Inspector and Deputy Inspectors of Mines during the previous year ending December 31st. Such report shall contain a statement showing the number of men employed in each mine above ground and underground, the number and nature of fatal and serious accidents occurring in each mine, the number of inspections made, and any other information deemed important.

Sec. 20. Removal of Inspectors and Deputy Inspectors.—Upon a petition signed by 100 miners, or 10 operators, or by three operators each employing 100 men underground, setting forth that the Inspector neglects his duties as prescribed in this Act, or that he is incompetent, and unqualified for the office of Inspector, or Deputy, as the case may be, or guilty of malfeasance in office, or guilty of any unlawful act tending to the injury of miners or the operators of mines, it shall be the duty of the Court to issue a citation to the Inspector, or Deputy Inspector, to appear on a day fixed, before said Court, and the Court shall investigate the allegations of the petitioners. If the Court shall find that said Inspector, or Deputy Inspector, is neglectful of his duties, or that he is not qualified under the provisions of this Act for such office, the Court shall certify the facts so found to the Governor; in the case of such finding against an Inspector, and to the Inspector of Mines, in the case of such finding against a Deputy Inspector, and the Governor or Inspector, as the case may be, shall declare the office of Inspector or such Deputy Inspector vacant, and steps shall be taken to appoint a properly qualified person to fill such vacant office of Inspector or Deputy Inspector.

Sec. 21. Care of Injured.—It shall be the duty of operators, Superintendents or any one in charge of any mine where ten or more men are employed, to keep at the mouth of the drift, shaft or slope, or at such other place as may be designated by the Inspector, a stretcher and a woolen and waterproof blanket, for use in carrying any person who may be injured at the mine. Where more than 200 persons are employed, two stretchers and two woolen and waterproof blankets shall be kept. And at all mines a supply of antiseptic gauze, carbolated vaseline, sponges, soap, carbolic acid, tables of bichloride of mercury, linseed oil, bandages, suitable towels and a wash basin shall be kept readily accessible for the treatment of any one injured. Provided, that in all mines where 500 or more men are employed, a First Aid Corps must be organized.

Sec. 22. Mine Maps.—The operator of every mine employing ten or more men underground shall maintain an accurate map of the workings of such mine. At least once in every six months the operator or Superintendent shall cause to be shown on the map of said mine, all the excavations made therein during the time elapsed since such excavations were last shown on said map.

Sec. 23. Failure to Make Map—Remedy.—Whenever any operator or Superintendent of any mine employing more than ten men underground, shall neglect or refuse to make such map of the workings, for a period of three months after the receipt of written notice so to do by the Inspector, or fails to add to such map all excavations made, then the Inspector is authorized to cause a correct survey and map of such mine to be made at the expense of the operator thereof, the cost of which shall be recoverable at law from said operator as other debts are recoverable by law.

Sec. 24. Storage of Inflammable Material.—It shall be the duty of the operator or Superintendent of each mine to store, or cause to be stored, oils and other dangerously inflammable materials in a covered building, kept solely for such storage, which building shall be at least 100 ft. from any other building and at least 300 ft. from any powder magazine.

Sec. 25. Storage of Explosives.—No blasting powder or any high explosive shall be stored in any mine. Provided, that nothing in this section shall be construed to prevent the operator of any mine from keeping sufficient blasting powder or other high explosive within such mine to meet the estimated requirements of such mine during the succeeding 24 hours; and provided, that such temporary supply shall not be kept at any place within such mine, where its accidental discharge would cut off the escape of miners working therein.

Sec. 26. Marking of Explosives.—It shall be unlawful for the operator or Superintendent of any mine to permit the use within such mine of any explosive containing nitro-glycerine unless there shall be plainly printed in English, on every package containing such explosive the name of the manufacturer of such explosive, together with the date of its manufacture.

Sec. 27. Superintendent to be Appointed.—The operator of every mine shall appoint a man who shall be in charge of the mine and the work done therein, who shall be designated as the 'Superintendent.' The Superintendent shall inspect, or cause an inspection to be made by some competent person of all mining appliances, boilers, engines, magazines, shafts, shaft houses, underground workings, roofs, pillars, timbers, explosives, bell ropes, speaking tubes, telephones, tracks, ladders, dry closets and all parts and appliances of said mine in actual use, and any such person or persons appointed by the Superintendent shall report any defects therein. It shall be the duty of the Superintendent upon ascertaining any such defects to take immediate steps to remedy the same so as to make the same comply with the provisions of this Act.

Sec. 28. Mine Foreman—Appointment.—The operator or Superintendent of every mine shall appoint a man who shall be personally in charge of the carrying out of the underground workings of the mine, and who shall personally direct the work of the men employed underground therein, who shall be designated as the 'Mine Foreman.' No person shall be appointed to the position of Mine Foreman who shall not be at least 21 years of age, and shall not have had at least two years of practical experience as an underground miner in metalliferous mines, and who shall not be able readily to read and write the English language.

Sec. 29. Duties of Mine Foreman.—The Mine Foreman shall attend personally to his duties in the mine, and shall see that the regulations for securing the safety of all men employed in such mine are carried out.

Sec. 30. Blasting.—Gang bosses shall be in immediate charge, and responsible for blasting within the mine. It shall be their duty to see that no iron or steel tools shall be used for tamping, and all miners are forbidden to use iron or steel tools for such purposes. It shall be the duty of the Mine Foreman to fix the time of all blasting and firing. Gang bosses and miners about to fire shots shall cause warnings to be given in every direction, and all entrances to the place or places where charges are to be fired shall be guarded while such firing is going on. In the event of shots fired by electricity, it shall be unlawful for any person knowingly to enter the vicinity of the mine where such shots are fired until the cable of the firing battery has been disconnected; it shall be the duty of the gang boss or miner in charge of the shot-firing to see that all such cables are disconnected immediately after such firing, and to examine, or direct the examination of such place where shots are fired, before any men are permitted to work therein. It shall be unlawful for any miner to extract or attempt to extract explosives from a hole which has once been charged, but in every such case a fresh charge shall be inserted above the missed explosive, and the same shall then be detonated. It shall be unlawful for any miner to deepen holes, or any part of holes, left standing or abandoned, and theretofore charged with explosives.

Sec. 31. Hoisting Engineer.—It shall be the duty of every Superintendent of every mine having a hoisting engine to appoint and designate one or more men, who shall be able to speak and read the English language readily, to be known as Hoisting Engineers. At all shafts where men are hoisted or lowered such hoisting engineers shall be not less than 21 years of age, and at shafts where men are not so hoisted or lowered they shall be not less than 18 years of age.

Sec. 32. Duties of Hoisting Engineer.—The following rules shall be observed by every Hoisting Engineer employed within this State: (1) It shall be the duty of every Hoisting Engineer to keep a careful watch over his engine and over all machinery under his charge. (2) He shall at all times be in immediate charge of his engine, and shall not at any time delegate any of his duties to any other person. (3) He shall familiarize himself with and use all signal codes for hoisting and lowering as directed to be used in this Act. (4) He shall not run his engine unless the same is properly provided with adequate brakes, indicators and distance marks on hoisting ropes or cables, as provided in this Act. (5) It shall be the duty of the Hoisting Engineer to exclude every person from his engine room, excepting any person or persons whose duties require their presence therein. (6) He shall hold no conversation with any one while his engine is in motion, or while attending to signals. (7) He must run his engine with caution whenever men are on the hoisting cage. (8) He shall not hoist men out of, or lower men into, any mine or shaft at a speed greater than 800 ft. per minute. (9) He shall inspect all hoisting machinery and safety appliances connected therewith, and all ropes and hoisting apparatus, as directed by the Superintendent, and shall report to him any defects found. (10) After any stoppage of hoisting for repairs, or for any other purpose exceeding one hour, he shall run a cage or other conveyance, unloaded, up and down the working portion of the shaft at least once, and shall not permit the cage or other conveyance to be used until the hoisting machinery and shaft are found to be in safe condition. (11) He shall do not hoisting in any compartment of a shaft while repairs are being made in the said compartment, excepting such hoisting as may be necessary to make such repairs. (12) He shall familiarize himself with and carry out the requirements of Rules 7, 8, 9, 10, 11, 12, 19 and 20 of Sec. 37 of this Act. (13) Any Hoisting Engineer or any person having in charge the hoisting machinery connected with the mine who shall wilfully violate any of the provisions of this section, or any of the rules contained therein, or who shall wilfully violate any of the provisions of Rules 7, 8, 9, 10, 11, 12, 19 and 20 of Sec. 37 of this Act, shall, upon conviction, be deemed guilty of a violation of this Act and liable to punishment accordingly. (14) The Superintendent shall post a copy of this section and the last preceding section in a conspicuous place on the door of the engine house.

Sec. 33. Hoisting Ropes.—It shall be unlawful to use in any mine any rope or cable for hoisting or lowering either men or material, when such hoisting or lowering is done by any means other than human or animal power, unless such rope or cable shall be composed of iron or steel wires, with a factor of safety determined as hereinafter set forth. The factor of safety of all such ropes or cables shall in no case be less than five, and shall be calculated by dividing the breaking strength of the rope as given in the manufacturers' published tables, by the sum of the maximum load to be hoisted, plus the total weight of the rope in the shaft when fully let out, plus 10 per cent of such values, to take account of shock at starting and stopping. All ropes must be inspected once in every 24 hours by some competent person designated for that purpose by the Superintendent, and it shall be the duty of the Superintendent to cause an examination to be made once in every succeeding three months of a section of

such rope or cable then in use for hoisting and lowering men and materials in such mine.

Sec. 34. Cages for Hoisting Men.—It shall be unlawful for the operator or Superintendent of any mine to permit the hoisting or lowering of men through a vertical shaft deeper than 500 feet unless an iron-bonneted safety cage be used for hoisting and lowering of such men, but this provision shall not apply to shafts in process of sinking. Every cage must have overhead bars of such arrangement as to give every man on the cage an easy and secure hand hold. Every cage or skip used for hoisting men must be provided with a safety catch of sufficient strength to hold the cage or skip with its maximum load at any point in the shaft in the event that the hoisting cable should break.

Sec. 35. Boilers and Connections, Machinery, etc., Inspection.—All boilers used for generating steam in and about mines shall be kept in good order, and the owner, operator or Superintendent shall have them examined and inspected by a qualified person, not an employee of said operator, as often as once in six months, and oftener if the Inspector or his deputy shall deem it necessary. All machinery used in or about the mine, such as engines, wheels, screens, shafting and belting shall be protected by covering or railing so as to prevent persons from inadvertently walking against or falling upon the same. The sides of stairs, trestles and dangerous plank walks in and around the mines shall be provided with hand and guard railing to prevent persons from falling over the sides.

Sec. 36. Prohibited Employment of Women and Children in Mines.—No woman or girl, and no boy under the age of 16 years, shall be employed or permitted to work within any mine within this State.

Sec. 37. Rules.—These rules deal with the following matters each being treated in detail: Additional duties of mine foreman and assistant mine foreman; candles; fire-fighting helmets; cages; hoisting while shaft sinking; deepening shaft-protection; whims; hooks; cross-heads; signals; punishment for interference with signals; signal codes; timbering; fencing disused shafts; abandoned shafts; penalty for destroying fencings and coverings; lighting; manholes; machinery and protection; protection against water; ladders and ladderways; enforcement of rules; passageway around shaft; sumps; stopes; winzes or raises; shaft stations; top of shaft; hoisting ropes; explosives; fuses; general rules.

When retorting, to prevent gold adhering to the sides of the retort, or to the cups placed in the large cylindrical retorts, the inside of the small retort or of the individual cups should first be well covered with a film of chalk or coated with a mixture of fine fire clay and graphite ground to a thin paste. Paint the inside of the retort with this and allow it to dry thoroughly. Clean the amalgam to remove all iron, and other foreign substances, and avoid heating retort above a bright red. If these instructions are carefully followed, there is little likelihood of the gold adhering to the sides of the retort or to the cups, if they are used.

SAFE AND CONVENIENT THAWER

When nitro-powder is exposed to a temperature approaching 45 F. it practically freezes and its usefulness as a blasting agent is largely impaired, or wholly destroyed, though it is still extremely dangerous to handle. Miners, and more particularly prospectors are much given to the innocent but extremely dangerous practice of placing sticks of dynamite against an inclined board, set before an open fire. This means of thawing powder is direct and gives the minimum of trouble, but it is also a means which often has deprived men of hands, eyes, or fingers, or otherwise mutilated them, while not a few have lost their lives. The safest way to thaw dynamite is in a can that is immersed in gently heated water. The accompanying sketch illustrates a simple, economical, and perfectly safe method of thawing frozen dynamite. It consists simply of an empty oil, or liquor barrel, fitted with return water-heating pipes, as shown, consisting of three pieces of 1¼-in. pipe and two elbows. The pipes are firmly screwed or driven into the side of the barrel, one near the bottom, the other near the top, but both below the water-level. The pipes should project 4 or 5 ft. from the barrel. Inside the barrel and about half way between top and bottom, a rack or platform should be arranged, upon which a 5-gal. oil-can may rest. This can be secured in place so that it will not float when the water is turned into the barrel. This may be done by means of cleats or weighting the can with iron or rocks. Fill the barrel with water to within two inches of the top of the can, and in the can place the powder to be thawed. Then build a fire under the pipe, as indicated in the sketch. The heated water rising in the vertical pipe enters the barrel and is replaced by cold water from the bottom of the barrel. In an hour, or so, all the water in the barrel will be scalding hot if the fire be kept up, but such high heat is neither necessary nor desirable. The powder thaws gradually and is safe at all times during the operation. The barrel should be provided with a substantial cover fitted with a handle, by means of which it may be readily removed. A separate cover for the can within the barrel would be an improvement, as it would prevent any condensation from the hot water accumulating in the can. It would also improve the outfit if the can were provided with a false bottom which could be easily removed. One thing must not be neglected in this or any other type of powder thawer—it must be kept absolutely clean at all times. If powder is thawed in it for some time and the can is not cleaned, small quantities of nitro-glycerine will accumulate in it, and some day an explosion will result.

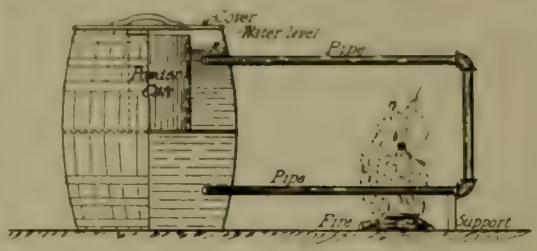


TABLE FOR STANDARDIZING SUMP SOLUTIONS

By C. W. Hess

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
.01	-3	-8	-8	-13	1	1-3	1-6	1-8	1-13	2	2-3	2-6	2-8	2-13	3	3-3	3-6	3-8	3-13	4	4-3	4-6	4-8	4-13	5	5-3	5-6	5-8	5-13	6
.02	-6	-13	1-3	1-8	2	2-6	2-13	3-3	3-8	4	4-6	4-13	5-3	5-8	6	6-6	6-13	7-3	7-8	8	8-8	8-13	9-3	9-6	10	10-6	10-13	11-3	11-8	12
.03	-8	1-3	1-13	2-6	3	3-8	4-3	4-13	5-6	6	6-8	7-3	7-13	8-6	9	9-8	10-3	10-13	11-6	12	12-8	13-3	13-13	14-6	15	15-8	16-3	16-13	17-8	18
.04	-13	1-8	2-6	3-3	4	4-13	5-8	6-6	7-3	8	8-13	9-8	10-6	11-3	12	12-8	13-6	14-3	14-13	16	16-13	17-8	18-6	19-3	20	20-13	21-8	22-6	23-3	24
.05	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
.06	1-3	2-6	3-8	4-13	6	7-3	8-6	9-8	10-13	12	13-3	14-6	15-8	16-13	18	19-3	20-6	21-8	22 13	24	25-3	26-6	27-8	28-13	30	31-3	32-6	33-8	34-13	36
.07	1-6	2-13	4-3	5-8	7	8-6	9-13	11-3	12-8	14	15-6	16-13	18-3	19-9	21	22-6	23-13	25-3	26-8	28	29-6	30-13	32-3	33-8	35	36-6	37-13	39-3	40-8	42
.08	1-8	3-3	4-13	6-6	8	9-8	11-3	12-13	14-6	16	17-8	19-3	20-13	22-6	24	25-8	27-3	28-13	30-6	32	33-8	35-3	36-13	38-6	40	41-8	43-3	44-13	46-6	48
.09	1-13	3-8	5-6	7-3	9	10-13	12-8	14-6	16-3	18	19-13	21 8	23-6	25-3	27	28-13	30-8	32-6	34-3	36	37-13	39-8	41-6	43-3	45	46-13	48-8	50-6	52-3	54
.10	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	55	58	60
.11	2-3	4-6	6-8	8-13	11	13-3	15-6	17-8	19-13	22	24-3	26-6	28-8	30-13	33	35-3	37-6	39-8	41 13	44	46 3	48-6	50-8	52-13	55	57-3	59-6	61-8	63-13	66
.12	2-6	4-13	7-3	9-8	12	14-6	16-13	19-3	21-8	24	24-6	28-13	31-3	33-8	36	38-6	41-13	43-3	45-8	48	50-6	52-13	55-3	57-8	60	62-6	64-13	67-3	69-8	72
.13	2-8	5-3	7-13	10-6	13	15-8	17-3	20 13	23-6	26	28-8	31-3	33-13	36-6	39	41-8	45-3	46 13	49-6	52	54-8	57-3	59-13	62-6	65	67-8	70-3	72-13	75-6	78
.14	2-13	5-8	8-6	11-3	14	16-13	19-8	22-6	25-3	28	30-13	33-8	36-6	39-3	42	44-13	48-8	50-6	53-3	56	58-13	61-8	64-6	67-3	70	72-13	75-8	78-6	81-3	84
.15	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84	87	90
.16	3-3	6-6	9-8	12-13	16	19-3	22-6	25-8	28-13	32	35-3	38-6	41-8	44-13	48	51-3	54-6	57 8	60-13	64	67-3	70-6	73-8	76-13	80	83-3	86-6	89-8	92-13	96
.17	3-6	6-13	10-3	13-8	17	20-6	23-13	27-3	30-8	34	37-6	40-13	44-3	47 8	51	54-6	57-13	61-3	64-8	68	71-6	74-13	78-3	81-8	85	88-6	91-13	95-3	98-8	102
.18	3-8	7-3	10-13	14-6	18	21-8	25-3	28-13	32-6	36	39-8	43-3	46-13	50 6	54	57-8	61-3	64-13	66-6	72	75-8	79-3	82-13	86-6	90	93-8	97-3	100-13	104-6	108
.19	3-13	7-8	11-6	15-3	19	22-13	26-8	30-6	34-3	38	41-13	45-8	49-6	53 3	57	60-13	64-8	68-6	72-3	76	79-13	83-8	87-6	91-3	95	98-13	101-8	106-6	110-3	114
.20	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120
.21	4-3	8-6	12-8	16-13	21	25-3	29-6	33-8	37-13	42	46-3	50-6	54-8	58-13	63	67-3	71-6	75 8	79-13	84	88-3	92-6	96-8	100-13	105	109-3	113-6	117-8	121-13	126
.22	4-6	8-13	13-3	17-8	22	26-6	30-13	35-3	39-8	44	48-6	52-13	57-3	61-8	66	70-6	74-13	79-3	83-8	88	92-6	96-13	101-3	105-8	110	114-6	118-13	123-3	127-8	132
.23	4-8	9-3	13-13	18-6	23	27-8	32-3	36-13	41-6	46	50-8	55-3	59-13	64-6	69	73-8	78-3	82-13	87-6	92	96-8	101-3	105-13	110-6	115	119-8	124-3	128-13	133-8	138
.24	4-13	9-8	14-6	19-3	24	28-13	33-8	38-6	43-3	48	52-13	57-6	62-8	67-3	72	74-13	81-8	86-6	91-3	96	100-13	105-8	110-6	115-3	120	124-13	129-8	134-6	139-3	144
.25	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145	150
.26	5-3	10-6	15-8	20 13	26	31-3	36-6	41-8	46-13	52	57-3	62-6	67-8	73-13	78	83-3	88-6	93 8	98-13	104	109-3	114-6	119-8	124-13	130	135-3	140-6	145-8	150-13	156
.27	5-6	10-13	16-3	21-8	27	32-6	37-13	43-3	48-8	54	59-6	64-13	70-3	75-8	81	86-6	91-13	97-3	102-8	108	113-6	118-13	124-3	129-8	135	140-6	145 13	151-3	156-8	162
.28	5-8	11-3	16-13	22-6	28	33-8	40-3	44-13	50-6	56	61-8	67-3	72-13	78-6	84	89-8	95-3	100-13	106-6	112	117-8	123-3	128-13	134-6	140	145-8	151-3	156-13	162-6	168
.29	5-13	11-8	17-6	23-3	29	34-13	41-8	46-6	52-3	58	63-13	69-8	75-6	81-3	87	92-13	98-8	104-6	110-3	116	121-13	127-8	123-6	139-3	145	150-13	156-8	162-6	168-3	174
.30	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	150	156	162	168	174	180
.31	6-3	12-6	18-8	24-13	31	37-3	43-6	49-8	55-13	62	68-3	74-6	80-8	86-13	93	99-3	105-6	111-8	117 13	124	130 3	136-6	142-8	148-13	155	161-3	167-6	173-8	179-13	186
.32	6-6	12-13	19-3	25-8	32	38-6	44-13	51-3	57-8	64	70-6	76-13	83-3	89-8	96	102-8	108-13	115-3	121-8	128	134-6	140-13	147-3	153-8	160	166-6	172-13	179-3	185-8	192
33	6-8	13-3	19-13	26-6	33	39-8	46-3	52-13	59-6	66	72-8	81-3	85-13	92-6	99	105-8	112-3	118-13	125-6	132	138-8	145-3	151-13	158-6	165	171-8	178-3	184-13	191-6	198
.34	6-13	13-8	20-6	27-3	34	40-13	47-8	54-6	61-3	68	74-13	81-8	88-6	95-3	102	108-13	115-8	122-6	129-3	136	142-13	149-8	156-6	163-3	170	176-13	183-8	190-6	197-3	204
.35	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147	154	161	168	175	182	189	196	203	210
.36	7-3	14-6	21-8	28-13	36	43-3	50-6	57-8	64-13	72	79-3	86-6	93-8	100-13	108	115-3	122-6	129-8	136-13	144	151-3	158-3	165-8	172 13	180	187-3	194-6	201-8	208-13	216
.37	7-6	14-13	22-3	29-8	37	44-6	51-13	59-3	66-8	74	81-6	88-13	96-3	103-8	111	118-6	125-13	133-3	140-8	148	155-6	162-13	170-3	177-8	185	192-6	199-13	207-3	214-8	222
.38	7-8	15-3	22-13	30-6	38	45-8	53-3	60-13	68-6	76	83-8	91-3	98-13	106-6	114	121-8	129-3	136-13	144-6	152	159-8	167-3	174-13	182-6	190	197-8	205-3	212-13	220-6	228
.39	7-13	15-8	23-6	31-3	39	46-13	54-8	62-6	70-3	78	85-13	93-8	101-6	109-3	117	124-13	132-8	140-6	148-3	156	163-13	171-8	179-6	187-3	195	202-13	210-8	218-6	226-3	234
.40	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160	168	176	184	192	200	208	216	224	232	240
.41	8-3	16-6	24-8	32-13	41	49-3	57-6	65-8	73-13	82	90-3	98-6	106-8	114-13	123	131-3	139-6	147-8	155-13	164	172-3	180-6	188-8	196-13	205	213-3	221-6	229-8	237-13	246
.42	8-6	16-13	25-3	33-8	42	50-6	57-13	67-3	75-8	84	92-6	101-13	109-3	117-8	126	134-6	142-13	151-3	159-8	168	176-6	184-13	193-3	201-8	210	218-6	226-13	235-8	243-8	252
.43	8-8	17-3	25-13	34-6	43	51-8	60-3	68-13	77-6	86	94-8	103-3	111-13	120-6	129	137-8	146-3	154-13	163-6	172	180-8	189-3	197-13	206-6	215	223-8	232-3	240-13	249-8	258
.44	8-13	17-8	26-6	35-3	44	52-13	61-8	70-6	79-3	88	96-13	105-8	114-6	123-3	132	140-13	149-8	158-6	167-3	176	184-13	193-8	202-6	211-3	220	228-13	237-8	246-6	255-3	264
.45	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	162	171	180	189	198	207	216	225	234	243	252	261	270
.46	9-3	18-8	27-8	36-13	46	55-3	64-6	73-8	82-13	92	101-3	110-6	119-8	128-13	138	147-3	156-8	165-8	174-13	184	193-3	202-6	211-8	220-13	230	239-3	248-6	257-8	266-13	276
.47	9-6	18-13	28-3	37-8	47	56-8	65-13	75-3	84-8	94	103-6	112-13	122-3	131-8	141	150-6	159-13	169-3	178-8	188	197-6	206-13	216-3	225-8	235	246-6	253-13	263-3	272-8	282
.48	9-8	19-3	28-13	38-6	48	57-8	67-3	76-13	86-6	96	105-8	115-3	124-13	134-6	144	153-8	163-3	172-13	182-6	192	210-8	211-3	202-13	230-6	240	249-8	259-3	268-13	278-6	288
.49	9-13	19-8	29-6	39-3	49	58-13	68-8	78-6	88-3	98	107-13	117-8	127-6	137-3	147	158-13	166-8	176-6	186-3	196	214-13	215-8	207-6	235-3	245	254-13	264-8	274-6	284-3	294
.5	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300

The above table shows the number of pounds and ounces of KCy necessary in any given number of tons of solution from one to thirty at strengths varying from 0.01 to 0.5%. This table has proved convenient for standardizing sump solutions. The top row of figures indicates the tons of solution to be made up to a standard strength and the decimals in the left-hand column are the strengths of solution. The number of pounds and ounces necessary to be added to the solution will always be found in the angle of the lines of these figures. For example, to find the number of pounds of cyanide necessary to add to 13 tons of solution to raise its strength 0.17%, follow down the column headed by 13 to the line on which the decimal 0.17 is found. The figures 44-3 there found, give the answer, 44 pounds and 3 ounces.

It is convenient to have indicators on the solution tanks marked in tons in preference to feet, since solutions are recorded in tons when calculations are made for standardizing or for running a given quantity on a charge of ore or for making pulp.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any communication is determined by its probable interest to the readers of this journal.

Cyanidation of Concentrate

The Editor:

Sir—The article in the August 27 issue 'Cyanidation of Concentrate,' by F. C. Brown, was particularly interesting and instructive, coming from an engineer whose reputation is world-wide, and who has done so much to bring the cyanide process to its present state, nearing perfection, both chemically and mechanically. Mr. Brown's article deals with finer grinding of the concentrate. I really wanted information about the process and results obtained when the concentrate was not reground. I will admit it is a crude way to treat it, but I plead 'not guilty' to the arrangements. A great difference of opinion existed at a certain plant, as to the best way to feed the solution, also the quantity. I shall explain the plant to be more clearly understood.

The ore was crushed through 20-mesh so called, amalgamation inside and on 12-ft. outside plates. Concentration was effected on a table and a 6-ft. vanner. There was no classification. The tailing went to waste, the concentrate to the tanks, by sluicing. The ordinary different length arm distributer was used, but it did not revolve, as the wheels of the carriage had been removed to allow of more grade from the concentrators to the tanks. This was revolved at times to allow a more even distribution in the tanks. A tank was filled in about 10 or 12 days. Lime was fed to neutralize acidity, but the amount I cannot give, on account of conflicting opinions: the alkalinity was kept at two and one-half, and the standard solution was 8 lb. per ton. The latter was used continuously and re-standardized. An argument arose as to the way of feeding the solution. The 'pseudo' in charge claimed that a better extraction would be gained by feeding a certain amount. I must state that solution was fed in the tanks for 12 hours and the other 12 was reserved to drain same. No account was kept of the amount of solution pumped, or used. The millmen pumped the solution on night shift when the storage tank was empty. The other opinion was that a better extraction would be obtained by using all the solution that could be run on, for the reason that the chief aim was the greatest possible contact between the gold content of the concentrate and the percolating solution. Will any engineer who reads this kindly give his opinion?

Sands, of course, would present a different proposition, but in the treatment of this concentrate I personally am inclined to agree with the latter statement given by the man running the plant, and not with the 'pseudo' in charge, for this and many other reasons. The young man in charge was decidedly better qualified to express an opinion, even if he should be wrong in this case.

Again, if too much lime were fed on the tanks, would it tend to form a slimy or colloidal matter on the zinc shavings in the boxes? It was found that this only occurred when the gold tanks became empty, and the colloidal matter in the bottom was allowed to run into the zinc boxes. The gold tanks were absurdly small, and often the flow into the zinc boxes had to be cut down to prevent this. In both cases the amount of precipitate obtained was cut down. Is this matter in the bottom of the tanks caused by adsorption? And would the solution so often used carry impurities which would cause a loss in the extraction by imperfect contact in the tanks and precipitation in the zinc boxes?

INGENIERO KCN.

San Francisco, September 30.

The Editor:

Sir—From all that I can learn concerning the treatment of concentrate by cyanidation, the greatest success attained has been after fine grinding, taking care always to expose the concentrate as little as possible to oxidizing influences. The experiments of Dr. Schidell at the Utica mine at Angels, California, those of W. G. Scott at the Black Oak mine, Soulsbyville, California, and of Mr. Diggles and others at the Melones mine, Robinson, California, all resulted in securing the highest extraction from finely-ground sulphides. In some instances as high as 96% extraction was reported as obtained from concentrate from canvas tables whereas the highest extraction on vanner concentrate seldom exceeded 72% of the gold and even less of the silver present. Experiments reported by others indicate that whatever may be obtained from ordinary concentrate, such as is generally recovered from concentrating machines, a much higher extraction is possible on the same material when it is finely ground. On low-grade sulphide it may not pay to regrind prior to cyanidation even if a higher extraction is obtainable by that means, consequently it resolves itself into a commercial problem, as well as a metallurgical one, for there are few metallurgists who take pride in carrying their operations to a point where the cost of recovery of metals exceeds their commercial value. Often a process is worked out successfully, when viewed from the chemical or metallurgical standpoint, but which is too expensive to admit of its application along commercial lines. The metallurgist then continues his experiments with a view to reducing the cost of the operation, and not infrequently he, or, as likely, some one else, succeeds in this and the 'impossible' process becomes a recognized commercial possibility and gladly accepted as such by all who have use for it.

CYANICIDE.

Seattle, September 22.

Esperanto

The Editor:

Sir—Doubtless you have long since formed your opinion as to the merits of Esperanto, the international language. I hope that it is favorable; but as there has been much criticism of Esperanto, especially on occasion of the recent international convention in Washington, I want to offer an opportunity

for every thinker to judge for himself. I have had prepared 100,000 brief grammars of the language in pamphlet form, and will send one free to any person who is sufficiently interested to ask for it, enclosing stamp for reply. I think it really due to this great movement for an international auxiliary language, which now embraces fifty nations in its scope, that you publish this letter, so that your readers may have the opportunity of judging for themselves.

ARTHUR BAKER.

700 E. Fortieth Street, Chicago, Ill.

[Doubtless there are many who will wish to avail themselves of this offer of Mr. Baker, that they may have an opportunity to investigate the mysteries of Esperanto.—EDITOR.]

The Make-Shift in Mining

The Editor:

Sir—Mining is a business which in most cases requires large capital for equipment and development, and often a goodly sum for operation as well, and those whose lot has been cast among the more fortunate enterprises, where capital was abundantly supplied; where every modern device was sought regardless of its cost; and where the prevailing idea was that thoroughness in up-to-date equipment meant economy of operation, would be surprised to know how much can be accomplished with the simple and inexpensive, though ingenious, mechanical contrivances, introduced by mine owners of small capital—often practically none at all, and by lessees whose bank account was all to be created. When I first went to Leadville and into Cripple Creek district the mines which I had left and with which I had grown up were large affairs. Ponderous hoisting machinery, great mills, and large-scale operations were familiar, and I was surprised to see some of the mines of the two Colorado districts mentioned which had become famous for output, and had earned world-wide reputations, equipped with small hoisting plants; two-post head-frames from which dangled trip-ropes, and many of them without mills of any description. In some instances a tripod straddled a shaft answering the purpose of a head-frame, and yet it had served its purpose in hoisting with a 'dinky' engine upward of a million dollars worth of ore. In Joplin district, of Missouri, may be seen surface equipments which would, and do, bring a broad smile to the face of a Western States' mining man, and yet these cheap, home-made affairs answer every purpose and not a few of them could be copied with advantage by some of our Western engineers, who like to plan and construct large works—too often before they have a mine. The tripod and the simple two-post head-frame, with their trip-rope attachments, have their place in the economy of mining as well as the tall, carefully designed, steel structure with automatically-dumping skips. Many a lessee has 'got his start' by working faithfully 10 hours or more a day, operating a hand-jig in making a rude classification of his ore—and not so rude either, for the hand-jig, when properly constructed and operated, is by no means a poor concentrator, but it is, like its fellow pioneer, the arrastre, a machine of woefully low efficiency, but again, each answers a certain useful purpose, and is the poor miner's make-shift. Much can be accomplished by means of these homely mechanical contrivances, and they should not be despised, for it is safe to say that the proportion of failures where the windlass, the dinky engine, the arrastre, and the hand-jig have been the main features of equipment, has been below that of those ventures characterized by magnificence of surface equipment and abundance of hot-air enterprise, at any rate the results of the failures of the former type have been less far-reaching in their disastrous consequences, involving but few and generally survived by the principals. Not that the principals of the latter kind do not survive—unfortunately they too frequently do, to repeat over and over again their peculiar hobby, that of extravagant equipment regardless of the actual demands of their enterprise.

OBSERVER.

San Francisco, September 24.

Indications of a Mine

The Editor:

Sir—I have frequently heard men claim that they could tell from surface indications whether a mine was good or not, some of these men even going so far as to pretend to be able to tell before the property was developed whether it would prove to be a valuable mine or not, when opened up. From my personal experience, which has been somewhat limited, I will admit, I have found it difficult to determine the value of a mine, even after it was developed, to say nothing of appraising it before it was opened. If there is anything in this forecasting the value of a mine before development I should like to know something more about it, and how it is done, if it is not a secret, and any one can learn how to do it. I do not deny that I am very doubtful as to the ability of any one to do this, still, there may be some who can. If so, I should like to know how.

MISSOURI.

Los Angeles, September 23.

[There are often certain physical and geological indications at the surface by means of which some geologists and engineers form an opinion as to the probable outcome of the development of a new property, but there are few who will go so far as to state even approximately the value of any undeveloped mine. Those geologists and engineers who have made these superficial indications a study may state that in their opinion a new mine is likely to become valuable or that there are indications which point to unsatisfactory results upon development, and it is surprising with what a degree of accuracy such predictions may be made under certain circumstances. In some instances it would, no doubt, be extremely difficult to make such forecast with any degree of assurance but in certain other cases it can be attempted with wonderful success. This is a large subject, and one upon which we will have more to say in a subsequent issue. The physical conditions referred to are simple and easily understood and the laws, if they may be dignified by so radical a term, are applicable to mineral veins in many regions.—EDITOR.]

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

Mercury traps are advisable in any gold mill, as they will generally save particles of gold, and amalgam as well as globules of quicksilver that escape from the plates.

Dampers in smokestacks leading from boilers should never be closed completely when there is fire on the grates as gas may accumulate and finally explode with disastrous results.

Gold is obtained as a by-product in dredging for tin in some of the streams of Tasmania. In New South Wales gravel containing less than two pounds cassiterite per ton is profitably dredged.

Vanadium ores are produced chiefly in western Colorado, from roscoelite and carnatite. The roscoelite is found in a thin layer of greenish sandstone near Newmire, and the carnatite near Cedar and in the La Sal mountains near Paradox. Mining operations are carried on in a small way near Newmire, where the ore, carrying 1 to 3% vanadium, is treated in a mill, the product being iron vanadate.

The gold veins of Porcupine district, Ontario, are described as occurring in the schists and quartzites of the Huronian and Keewatin, and vary from a few inches to 80 ft. or more. The veins are of white quartz, some of which is rich in coarse gold. Sulphides are found in all the veins, sometimes abundantly. The ore is stated to be free milling. The Porcupine camp is 100 miles north of Cobalt and 400 miles north of Toronto. There are over 2000 people now in the district.

Capacity of stamp-mills is influenced by many considerations, among them the width and shape of the mortar, weight of stamps, height and number of drops, height of discharge, size and kind of screen, and superficial area of screen, amount of water fed, and as important as anything else, the character of the ore. A granular ore will generally crush more rapidly than a flaky ore, such as flint. This latter will discharge more rapidly through a slotted sheet-steel screen than through one of woven cloth.

Lake Lahontan is the name of an ancient Quaternary body of water in western Nevada. All that now remains of this once large body of water, covering at one time 8422 square miles, and draining an area of 40,000 square miles, is a lake bed in which water covers but one twenty-fifth to one thirtieth of its original surface. Like all other lakes, Lahontan continued as a body of fresh water so long as the annual rainfall exceeded the annual evaporation, but when the evaporation exceeds the rainfall the area of the lake begins to diminish, and if these conditions continue the lake gradually becomes smaller, eventually drying up altogether. The Western Pacific railroad runs along the bed of this famous dry lake for more than 130 miles. The terraces which mark the irregular recession of the water can be plainly seen skirting the lake shores for many miles.

In the arrastre the drags should be drilled to a depth of several inches near the edge on the upper side, and iron eye-bolts inserted (wooden plugs will do), to which chains may be attached. The drags should be so disposed from the horizontal rotating arms that they will pass over the entire surface of the basin with each revolution of the central post. The drags should be of the hardest and toughest stone available, and should weigh 200 to 300 lb. each. Massive greenstone and fine-grained granite make good drags. Each drag should be suspended so that one edge is lifted above the basin an inch or two, the opposite edge resting on its floor. This permits the broken ore to pass beneath the drag as it sweeps around the basin. If the drag lies flat it will push the ore along in front of it and its grinding capacity will be greatly diminished. In order to secure capacity the rock should be crushed to small size before going to the arrastre. This may be rapidly done by breaking the ore to size of hazel nuts or smaller, in a large hand mortar over which is suspended a heavy pestle from a spring pole. The operator will find plenty of time to do this while a charge is being ground in the arrastre. A speed of 30 revolutions a minute is not too fast, and even this is rarely reached where animal power is employed. Arrastres are sometimes driven by water-power, and occasionally by gas engines.

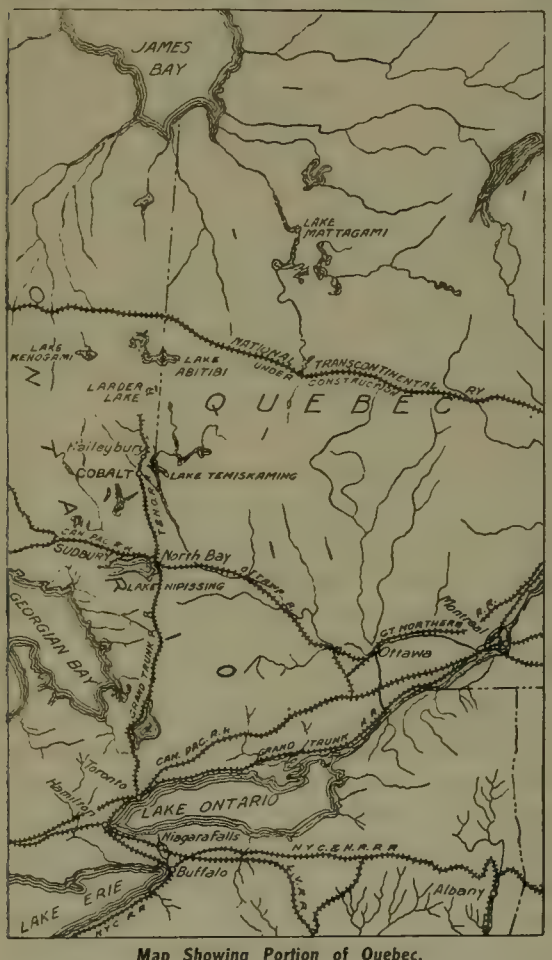
In pan amalgamation of gold and silver ores, the method of feeding and discharging the pans continuously is known as the Boss process, after the inventor, M. P. Boss. No pan amalgamation is accomplished without the addition of copper sulphate and sodium chloride (salt), to the charge as well as mercury. The chloride of silver, whether a natural constituent of the ore, or produced from the sulphides by chloridizing roasting, becomes metallic in the presence of the chemicals in the pan with the iron particles, derived from the crushing machinery and from the pan muller. The quicksilver then amalgamates the metallic silver and the gold present. There is no tendency on the part of the chloride of silver to flour the mercury, and if this is taking place in the pan it is due to some other cause, possibly some deleterious mineral in the ore, such as antimony, arsenic, or manganese di-oxide. The grinding should be done before the mercury is fed to the charge. This requires from four to eight hours. The mullers are then raised and the quicksilver for amalgamation added. It is important that the charge in the pan be neither too thick nor too thin. If the former the mercury will become finely divided and may flour, causing loss, as it seldom is all re-collected in the settler. If too thin the mercury will not rise from the bottom of the pan and thoroughly mix with the ore, which escapes in the tailing carrying away a portion of the precious metal that might have been saved. Also, the pan-mullers must be rotated at proper speed, with a view to proper mixing of pulp and mercury. Zinc amalgam is one of the best correctives for floured quicksilver.

Special Correspondence

TORONTO, CANADA

Increased Market Activity. — New Orebodies. — Government Subsidy.

The past two or three weeks has witnessed a marked revival of public interest in the Cobalt mining issues, confined almost altogether to the lower-priced stocks, which have advanced considerably all along the line. Buying orders have lately been coming in freely from New York, as well as from Haileybury, Cobalt, and other points in the mining region, and the profit-takers are now taking advantage of the situation, causing a swift recession. A noteworthy feature has been the rehabilitation of the Green-Meehan, the stock of which had for some time been on the bargain counter at from one to two cents. The leasing of



Map Showing Portion of Quebec.

the property for five years to a syndicate headed by E. C. Kingswell, under whose management $30,000 will be spent in development, created a heavy demand for the stock, large quantities of which changed hands at from 4 to 6c. Good news from the camp has also given an uplift to the Beaver, Temiskaming, and Rochester issues, and the brokers begin to anticipate an active fall season. The August statement of the Temiskaming shows a total production from mine and mill of 251,968 oz. silver of the net value of $125,984, the cost of production being $22,014, leaving a profit of $103,969. New veins have been struck at the Beaver; recently in driving from the winze on the 300-ft. level a vein carrying 5000 oz. ore was cut, and subsequently a 10-in. vein was found in new territory at the end of a cross-cut on the 200-ft. level, and another 8 in. wide., on the 250-ft. level in a cross-cut east from the main shaft. The latter is 30 ft. from the Temiskaming line, on the other side of which the ore assays between 3000 and 4000 oz. per ton. These finds encourage the hope that development at depth will bring good returns. A rich surface vein has been found on property adjoining the Rochester, about 100 ft. from the old Rochester shaft, in which the vein was lost at a depth of 50 ft. two years ago. It is supposed to be the missing vein and driving will be undertaken to pick it up. The Nova Scotia is working in very rich ore, stated to assay 10,000 oz. per ton, on the fifth level, but its ownership is doubtful, as the strip which contains the vein is the subject of litigation between the Nova Scotia and Peterson Lake companies.

A 12-in. vein has been found in the Ophir shaft at a depth of 286 ft., containing niccolite, argentite, and some ruby silver. It is uncertain whether it is a new vein or one which disappeared at 250 ft., at which depth it showed a width of 5 in. The Black Mines Consolidated has exhausted its funds and the shareholders have authorized the pledging of all assets to secure a loan of $25,000 to carry on operations. A particularly audacious robbery was committed at the Nova Scotia mine, Cobalt, on the night of September 5, when a gang of burglars bored through the walls of the concrete vault over a foot in thickness, and abstracted 27 bars of bullion valued at $17,500. They were evidently professionals and it is thought must have been familiar with the premises. The Mikado gold mine in the Lake of the Woods district bids fair shortly to rank among the producers. Work was recently resumed and stoping and development are going forward actively on the upper levels. The mine has been unwatered down to the 400-ft. level. It is estimated that there is enough ore of milling grade in sight to keep the 20-stamp mill going for two years. A gold bar, valued at $1200, has been obtained from sweepings collected while the mill was being repaired. Twenty-six men are employed.

William Templeman, Canadian Minister of Mines, made an important announcement at Nelson, B. C., in the course of the tour through the west by Sir Wilfrid Laurier and his party. He stated that the Department had decided to grant a further subsidy for lead ore and to undertake experiments with a process for recovering metal from the low-grade now prevalent in that district. Two experts had been engaged to conduct the experiments which would be made at the Nelson smelter. A party, including John W. Gates of New York, D. D. Mann of Toronto, J. J. Mitchell of Chicago, Joseph Sellwood of Duluth, and other capitalists, last week inspected the Moose Mountain Iron mines, north of Sudbury. The present output is 400 tons of concentrated ore per day, which within a year will be increased to 1000 tons. The ore is marketed in Cleveland.

LONDON

Dolcoath.—Carn Brea & Tincroft.

In my last letter I referred to the Dolcoath mine and its most recent developments. At the meeting of shareholders held this week, R. Arthur Thomas, the manager, gave some information in addition to that contained in his half-yearly report. The most important was that the current half-year's output would probably be less than the recent average, owing to the dismantling of some of the old Cornish stamps which are to be replaced by Holman air-cushion stamps. He described shortly the electrical plant now being installed at the new shaft and mentioned that the pumps will only handle the water from the lowest levels, the pumps in Harriett's shaft being left to deal with the upper flows. The general impression given at the meeting was that, though the dividend has been passed for the first half of the present year and the output is being temporarily reduced, the situation will be greatly improved by next spring. Not only will the capacity of the dressing plant be increased, but the amount of ore raised will be greater and the cost of mining diminished.

The present position of Carn Brea & Tincroft, an old combination of mines between Camborne and Redruth, is once more critical. Details of the position were given recently, but briefly it may be stated that the company has

arrived at a stage of its history when modern methods must be applied. It is usually said that the curse of Cornwall is the unsympathetic greediness of the owners of the mineral rights and when we remember that the Tehidy Estate exacted a fine or premium of £30 000 on the renewal of the Dolcoath lease some years ago it is no wonder that bitter feelings are extant in Cornwall. The Carn Brea & Tincroft company has two lords, the Carn Brea belongs to the Tehidy Estate and the Tincroft to Lord Clifden. The latter is more liberal to the mines than Mr. Basset of Tehidy. Probably he can afford to be so seeing that he draws immense royalties from the more prosperous industry of china clay in the St. Austell district. He has foregone his royalties at Carn Brea & Tincroft during the last twelve years to the extent of £15,000, and has in addition invested £12 000 cash in the purchase of shares. At the recent meeting of shareholders his agent, John Gilbert, who is his representative on the board of directors, spoke pretty plainly to those who wanted further favors from the ground landlord. His two points were well made and hit his fellow directors hard. In the first place he reminded the shareholders that he had for years strenuously advocated the adoption of magnetic separation, for the reason that not only was a valuable mineral wolfram, being lost as a source of income, but that its presence in the tin concentrate caused the price obtained to be £5 to £10 less per ton than the better qualities sold at the 'ticketings.' To prove his belief he announced that Lord Clifden would personally stand the expense of putting up a magnetic plant. Mr. Gilbert's other point was that the buying of plant and stores was conducted in an uneconomical way. This is a delicate question, and unfortunately it is one that might be discussed at other mines in Cornwall. The manager has no free hand to buy materials in the cheapest market. In other words, he is tied, and purchases are made to suit the influential dealers who have a 'stake' in the mine. Some interesting remarks were also made at the shareholders' meeting, by James Wickett, the stockbroker of Redruth. He spoke plainly and said that the reason he preferred tin properties in the East Indies was that lord's dues and vested interests were not the controlling factors of the situation there as they are in Cornwall. This attitude of Mr. Wickett explains his policy of recommending tin investments in the Malay rather than in Cornwall.

ST. PETERSBURG, RUSSIA

Central Asian Gold.—Syr Darinsk Province.—Samarkand Province.—Ferghana.—Semirtchensk.

Although some mention has been made of the existence of lode gold in Turkestan, the same has not been discovered, though many efforts have been made to find it. The mining engineer Kulivin, who went over the ground especially with the object of finding veins of lode gold, as did also the investigator of Turkestan, Seviertzef, declared that there must be lode gold on the upper reaches of the rivers Tchirtchik and Talassa. This of course is common to great tracts of land in Asia. Investigators are firmly persuaded that lode gold does exist; but hitherto they have had to be content, at all events the practical ones, with the working of alluvium. It is well known that gold sands have been worked on the tributaries of the rivers Tchetkal, Talassa, Kegen, and Zaravschan. These sands are usually to be found on the banks of the rivers in contiguity to considerable expanses of granite, and on the tributaries where granite has not been exposed the gold sands have not been found.

Gold has been found in the Syr Darinsk province by the natives in the river, alluvium resulting from the decomposition of granite, porphyry, and limestone. Work in connection with the exploitation of these deposits has chiefly been conducted along the bed of the Tchirtchik where the gravel yields on washing about 5 dolis* per 100 poods.† Placer gold has also been found in the basins of the Talassa, Kurkursu, Bobokan, Bokair, and Yulmaral. In one of the smaller streams flowing into the Kurkursu during the investigation as high a content as 70 dolis of gold per 100 poods of ground were recovered. On the river Yulmaral and its tributary the Tchintaschu the gold on being tested was found to amount to 12 dolis per 100 poods. The form of the gold found here is usually in thin flakes or fine dust. It is very seldom that it is found in the form of grains, though recently there have been cases when small nuggets have been recovered from the river Tchirtchik near Britch Mulla. Among the tributaries of the river Arys gold has only been found on the Kulanu, but here the content has proved to be very disappointing, never exceeding 12 dolis per 100 poods.

In the Samarkand province gold has been found throughout the whole course of the river Yaravschan. It is in the form here of small grains and thin flakes. In all probability it finds its origin in the conglomerates which lie in some places on the banks of the river. Coming now to the well known district of Bochara, we find that gold washing is one of the industries of the natives along the valleys in the rivers of the Amu darye system. However, the content of precious metal is small, so small that three or four men can scarcely earn more than 16 to 25c. per day, and were it not for the extreme poverty of the people it may safely be assumed they would not engage in this industry at all. There is a better gold content to be found in the conglomerate which reaches a considerable thickness in the valleys of the river Mjar su, Yach su (Tal-bar), and from their tributaries in the northeastern part of Balguan; also along the river Miyu in Kulyavsky and along the rivers Sari ob, Kilimbaya, and others in the northwestern parts of Darvasky and in the southeastern parts of the same neighborhood, along the river Tchavsol, which is a tributary of the Rovnau. These conglomerates consist of pebbles and lumps of granite, syenite, diabase, quartz, and selenite rock combined with clay, sandstone, and cement. The gold is chiefly found in the cement and in the quartz shingle. The working of the alluvium by the natives is done in the open, underground operations being rarely attempted, though methods of working the gold are so primitive that practically half of it is lost in the waste. The form in which the gold is found in the places named is chiefly in flakes, and the content is 32 to 80 dolis per 100 poods. It has been known even to reach 1 zolotnik.*

The mining engineer, Zhoravko-Pokorsky, who has been very much occupied of late years in working the sands of Bochara, considers that the richest of the conglomerates is along the river Yach-su, near the village of Talbar, and along the Mazar-su and the upper reaches of the said river. During the nineties he began investigations in the depressions of these rivers, and then it was seen that in the upper beds the gold was very small, but immediately underneath, the gravel could be worked with profit, and the proportion of gold continued to grow with the depth. In 1904, out of 316,000 poods of ground, 5 funts† 17 zolotniks 95 dolis of gold were washed, and in 1905, out of 516,000 poods, 7 funts 12 zolotniks 78 dolis were washed, while during eight months of 1906 as much as 6 funts 27 zolotniks 9 dolis were washed out of 720,000 poods of ground.

Another well known area is Ferghana. In the southern portion of the province of Ferghana three auriferous areas are known. In two of them, namely, on the rivers Kok-su, flowing into the Surchob, and on the Suok-su, flowing into the Muk-su, gold-bearing gravel is being worked, while on the third area near the river Polis the workings have for the present been abandoned. On the river Kok-su, about 18 versts from its mouth, gold sands are to be found which are being exhibited by Karatigins, and on the river Suok-su gold mines are found 15 versts above its mouth. The gold found is coarse. The bed of the Polis was previously exploited by Chinese. This area is just about the frontier between Russian territory and Bochara. In the first two deposits the road leads from the town of Skobelieff, named after the famous Russian general, through Utch-kurgan.

†1 pood = 36 pounds.

*1 doli = 0.6857 Troy grains.

*1 zolotnik = 65.8329 Troy grains.

†1 funt = 13.1665 Troy ounces.

From Skobelieff, which town, by the way, is dwindling in importance, to the sands on the river Kok-su, a distance of 156 versts farther through the road of Ters-agar, the road follows to Altyn-mazar, a distance of 61 versts, and on to the mouth of the Suok-su, about 15 versts above which the gold sands are found. The road to the third also leads from Altyn-mazar to the south, passes the glacier of Fedtchinko to the frontier area of Polis, from which point the sand is found at a distance of about five or six versts. At Altyn-mazar the production of gold per man does not exceed 6c. per day. The analysis of this gold gave 87% gold, 5.4 silver, and 7.2 copper. Farther down the Muk-su the known gold sands at the villages of Chodzha-tan and Tal-bar are to be found, and gravel is also worked on the stream Surchob, which is a tributary of the Muk-su. In this district it was proposed to begin investigations as far back as 1896, and concessions had been asked for this particular purpose, though for reasons not explained no effort has been made to carry on the work. Investigation for gold has likewise been carried on in the district of Namangan in the province of Ferghana along the river Santalasch, which is a tributary of the Tchotkol. In this place allotments for the purpose of exploiting gold deposits not far from the point where the Santalasch meets the Tchotkol were made as far back as 1908. The upper strata of the same are poor, but lower down there is a higher percentage of gold. Some samples gave as much as 2 zolotniks 18 dolis per 100 poods. Nevertheless, these promising beds of auriferous sands have not been worked up till the present.

The gold sands along the river Tentek, in the province of Semirctchensk, which flows into Lake Balchasch, have been considered particularly rich. In the area bordering on Kisyl-Togo, claims were made, but on proceeding to work it was found that the sands were too poor, and the same is the report made on the sands found along the river Argait. In the valley of the river Ketman the remains of gold workings previously abandoned by the Chinese have been found. On the Ketman work has been carried on at the Ivanovsky mines in the Dzharkent district and at the Grigorievsky mines in the same district on the river Bayankol. In the early part of 1894 as much as 7 funts gold were obtained here and almost as much was found in 1895. The quantity obtained grew to over 8 funts in 1896. The Ivanovsky mine is being worked, and although data are not available up to date, the figure 1 funt 73 zolotniks of gold is given as that washed in 1907. Gold is also found in other rivers of the province of Semirctchensk, in the basin of the river Ili and on the right bank of its tributaries, the Choigos, Borochuzhir, Useku, and others, and in the basin of the lake Issyk-kul and the river Tekess, along the valleys of the rivers Ak-su, Dzhukka, about 30 versts to the north from the village of Krabulaksky in the district of Kopalsky; along the river Tchyhol, 25 versts from the same village and in the boundary district of Balektasch, along the river Ak-tche, and in other places.

JOHANNESBURG, TRANSVAAL

Quarterly Reports.—Rodesian Output.

The batch of quarterly reports just issued by Rand gold mines for the three months ended June 30, clearly demonstrates the progress of the Main Reef mining industry and analyzes the achievement of individual mines. An examination of the various statements submitted to shareholders shows that during the period under review several companies earned substantially larger returns than in the preceding three months, while at the same time other mines, on account of labor shortage, labor inefficiency, and in one or two cases because of the poor grade of ore worked, performed less satisfactorily than they did in the previous quarter. Among the most important advances in profit earning is the improvement manifested in the returns of the great Wernher-Beit or Eckstein holdings known as the Crown Mines. In the June quarter the average monthly profits amounted to £101,513 as compared with £88,680 in the March period. The other great producer, the East Rand Proprietary Mines, did not do quite so well in the three months ended June 30 as in the quarter ended with March, but the earnings are maintained at well over £100,000 per month, or 50% on the issued capital of the company. The Robinson maintained its rate of earning and the Simmer & Jack improved its returns to a very substantial degree. The Village Main Reef Co.'s profits have improved to the extent of about £6000 per month, largely on account of more selective and careful mining. The Robinson Deep's earnings have been a little less satisfactory while the New Modderfontein's production and profits have steadily increased. This company controls one of the largest and most promising properties on the Witwatersrand. It has never yet been worked on a scale commensurate with its enormous potentialities but the company is now fast getting into its stride and it is worth noting that in the twelve months ended with June last, the company's mill crushed 523,950 tons as compared with 352,816 tons in the preceding year and increased its profit from £239,477 to £279,952. These are the largest and most important producers in these fields, their achievements may be taken to represent the trend of the whole industry, and an examination of their latest reports clearly shows that although the pinch of labor has been felt, the Rand, by reason of its inherent industrial stability, is not going to signalize the realization of its difficulties by a diminution of output. The production for the current year will in all probability be at least 2½% in excess of the yield for 1909.

The gold output of southern Rhodesia for the month of June was valued at £214,709 as compared with £224,888 in May. Contributions from coal and base-metal producers brought the total value of the mineral yield up to £238,916. The percentage decreases in the gold output of the country are attributable to scarcity of labor and also because many properties which have been producing for some months past have, in consequence of option holders pressing forward development work, had their stamps partly hung up. This does not, of course, really indicate any set-back. On the contrary it shows that in a few months' time the returns from these mines will be larger than hitherto.

ALPINE, TEXAS

Terlingua District.—Presidio County.—Moriba. — El Paso Tin Mining & Smelter Company.

A large amount of new capital has been invested in quicksilver mines in the Terlingua district, eighty to ninety miles south of here, during the last few months, and the erection of two or three additional furnaces is planned. The Chisos Mining Co. continues to be the chief producer of quicksilver in the district, its monthly output of the metal averaging about $15,000 in value. Prospecting has been done recently on land situated some distance away from the proved cinnabar field and good claims are being opened. It is known that there are rich deposits of quicksilver across the Rio Grande in Mexico, fifteen to thirty miles from Terlingua. While a number of claims have been denounced on the other side of the river by Americans no development has as yet been done owing to the remoteness of the region from railroad transportation facilities. One of the great difficulties that is met with in the Terlingua district is the long distance that machinery and supplies must be hauled. It is ninety miles from Alpine to Terlingua, this being the nearest railroad point. It is reported that the Kansas City, Mexico & Orient railroad, which is to run through Alpine, may construct a branch line south through Terlingua into Mexico to a connection with the proposed railroad that is to be constructed between Monclova and Chihuahua. It is stated by men who are familiar with the territory which the proposed branch line would traverse that it would be the means of opening to development mineral districts of great richness. It would also penetrate the heart of the region of Texas and northern Mexico where the guayule shrub, from which rubber is now being manufactured, grows abundantly.

H. B. Young, of Shafter, and associates, who recently purchased a section of mineral land in the Shafter district of

Presidio county are preparing to develop their holdings. This property adjoins the rich silver mines of the Presidio Mining Co. which have yielded more than $11 000 000 worth of silver during the last twenty five years that they have been operated. These mines are still producing large quantities of rich ore. One of the claims upon the section that Mr Young and associates have purchased was formerly worked under lease by the Presidio Mining Co. The ore was treated at Shafter in a 15-stamp mill with pan amalgamation. William B. Phillips of Austin director of the bureau of economic geology of the University of Texas recently made an examination of the property of Mr Young and associates. He says concerning the mine: The ore is essentially a silver chloride (horn silver) held in a siliceous limestone. With the horn silver there is associated more or less galena rich in silver, with a little sulphide of silver and, very rarely, thin sheets of native silver. The

Terlingua Mines, Texas.

average quality of the ore does not exceed 30 oz. in silver per ton, but richer material occurs in more or less isolated patches, even up to 200 oz., picked specimens assaying as high as 2300. The orebodies are chamber deposits in limestone. These chambers are frequently of great size and extent and yield large quantities of ore. Some of these chambers begin near the surface and continue to the 200 and 300-ft. levels, containing good ore all the way down. There are excellent opportunities for silver mining in the Shafter district. Successful operations have been conducted there for more than twenty-five years, and the character of the ore and its extent have been established beyond question."

SALT LAKE, UTAH

International Smelting & Refining Co. — New Converter Practice. — Sources of Ore Supply.

The plant of the International Smelting & Refining Co., at Tooele, Utah, is operating with four of its five reverberatory furnaces, and the fifth is being clayed and made ready for use. These furnaces are each 19 by 102 ft., four of which have connections with the battery of Sterling waste-heat boilers. The fact that the designs and specifications for the reverberatories were so skillfully made is said to be due to the efficiency and watchfulness of Joseph Jetté, of Anaconda, who had personal supervision of their construction. The four furnaces thus far have been smelting close to 560 tons daily of calcined ore from the roasters, producing a matte which runs 20 to 30% copper, the slags running approximately 40% silica, 48% FeO, and 4% lime. The five stands of converters, each 96 by 150 in., tilted by electrical equipment, are working satisfactorily. The lining is made up of silicious ore and local clay. A sixth converter is being put in. The electric cranes work admirably. The principal one serves the converters in the usual manner; the smaller one serves to lift the converter slag to a plane at the top of the building, conveying it thence to any one of the reverberatory furnaces, pouring it through iron spouts. A. M. Day, general foreman of furnaces and converters, has developed a method of increasing the efficiency of copper converters by injecting into them through tuyere openings pulverized ore, concentrate, and fuel during the progress of the converting process. The metal-bearing material thus injected serves to enrich the matte derived from the furnaces, and the fuel thrown in intensifies the heat of the molten matte, increasing the calorific power. His method is undergoing trial at the Step toe Valley plant at Smelter, Nevada, and it is probable that the process may be tested at this plant. The slag from the reverberatories is hauled to the slag dump in 22-ton cars, each car having electrical appliances for tilting the pot and discharging the slag. Every kind of haulage about the plant is by electric locomotives. The 32 McDougall roasters have capacity for calcining 10 tons each per day of ore, reducing the sulphur therein from 28 to 6%. At present only about 700 tons per day is being calcined. Thus far the supply of ore comes from the Highland Boy mine of the Utah Consolidated Copper Co., at Bingham, the transportation being over that company's aerial tramway, built by the Trenton Iron Works. However, the South Utah Mines & Smelters Co. is under contract to supply 100 tons of concentrate per day, which it is presumed may contain 13% copper, 30% iron, and high in silica. This property is at Newhouse, Beaver county, and it is understood that shipments are beginning. The operating staff comprises E. P. Mathewson, general manager; H. N. Thomson, superintendent; L. T. Sleka, mechanical superintendent; O. M. Kuehs, chief chemist; William Carder, in charge of sampling mill; Alexander Husband, cashier.

NEW YORK

Railroad Rate Case. — Mexican Mergers. — California Oil.— Cobalt Dividends.

The first break in the gloom which has held Wall Street shrouded in uncertainty so long came this week in the form of the decision of Special Master in Chancery Otis in the Minnesota railroad rate case, who holds the drastic railroad rate law, passed by the Minnesota legislature three years ago to be unconstitutional. While Wall Street realizes that corporate regulation will come, yet it has feared legislation passed in vindictive retaliatory spirit, and this decision is the first of importance nullifying such legislative action. While there has been a slackening of business throughout the country, yet conditions have become more acute and the stagnation more complete in Wall Street than elsewhere. The volume of trading is nominal save in those issues in which strong pools are known to operate, as in Steel and Reading. The political situation is one of the most important of market factors and the uncertainty in that quarter must continue several months longer. In mining markets there is little public interest.

Steps leading to the point where Ray Consolidated and Chino Copper are to become producers are being completed. The American Smelting & Refining Co. has taken a long-time contract to handle the Chino ores at the El Paso smelter. Ray Consolidated is to have a smelter, but its product and that of the Chino goes to the American Smelting & Refining Co.'s refinery at Perth Amboy, N. J. Contracts covering the marketing of the metal have been signed. Both the refinery at Perth Amboy and at the El Paso smelter are to be enlarged. The recently formed Arizona-Cananea Mines Corporation, owning 4000 acres adjoining the Greene-Cananea in Sonora, Mexico, has acquired the Boston-Miami which adjoins the Live Oak, just south and west of the Miami, the Inspiration, and the Keystone, in Globe district, Arizona. The deal also included the Montezuma claims which adjoin the Boston-Miami. It is said that an examination of conditions at Ely and at Salt Lake has convinced John D. Ryan that it will be necessary to equip the Giroux with a smelter, rather than stand the long haul from Ely to Tooele. The Mexican Metals Co. and the Arizpe Copper Co. are to be merged. Both properties are in the Cananea district, Sonora, Mexico. There is effort being made to interest the Eastern public in California oil propositions, but a lack of knowledge of the field and a lack of data on which to base any comparisons has made it difficult to accomplish anything. When Associated Oil was listed on the New York Stock Exchange it was thought it would prove a leader for a group of oil stocks; it has, however, been allowed to remain inactive, and there are many days in which no quotation is registered. Now,

however, there is a new leader for the oil group. The Texas company, headed by John W. Gates, which has grown to be a formidable rival of the Standard Oil Co., has applied for trading privileges for its $27,000,000 capital stock. A tin mine in the Piedmont district, Lincoln county, North Carolina, is the most recent mining venture in the South. A 6-ton mill is to be erected for the company which is known as the Piedmont Tin Co. The regular quarterly meetings of the Nipissing Mines Co. and the La Rose Con. were held this week and the regular quarterly dividends declared. In the case of Nipissing 7½%, La Rose 2%. While it is admitted that the matter of merger was discussed, it is said that conditions on the La Rose have so far improved that a new basis for consolidation would have to be reached. The Bailey Cobalt Mines Co. is installing a small experimental smelter, which will use oil as fuel. Two furnaces have been erected. The high-grade ore will be hand-sorted and smelted instead of shipped. There are many concentrators in Cobalt, but this will be the first smelter.

LOS ANGELES, CALIFORNIA

Mining Congress Assembles. — Pinchot's Address Well Received.— Lively Discussion of Oil and Conservation Matters.—California Oil Industry.—Clara Consolidated.—United Mines Company.

The thirteenth session of the American Mining Congress has been in session here this week. Extensive preparations had been made to care for the members and delegates and neither the citizens nor the visitors were disappointed. Many buildings were decorated and everywhere the city had a gala look. The Sierra Madre Club, the Chamber of Mines, and the Chamber of Commerce, joined in taking care of the visiting mining men. At the Club all members

Museum of Los Angeles Chamber of Mines, Germaine Building.

were made at home, and a reception was held Monday evening. Tuesday evening the Chamber of Commerce was host while at Wednesday noon the Chamber of Mines gave a luncheon at Hotel Alexandria. These and other festivities fully occupied the time between sessions of the Congress. The important features of Monday's session were the delivery of the presidential address by E. R. Buckley, and the discussion of Conservation by Gifford Pinchot. Mr. Buckley made a strong appeal to mining men to approach the problems of the industry in a thoughtful manner. He outlined the work and the field of the Congress in a manner that held the close attention of the large audience. Mr. Pinchot, who had prepared for the occasion by a special trip through the oil regions, first removed some misapprehensions as to just what the Conservationists were asking. He discussed the general subject briefly, insisting that conservation was but the application of business sense to the problems of the Nation, and that the whole people should be trusted to solve those problems. He maintained that conservation did not imply checking of development but that in order to secure the latter it was by no means necessary to give everything away for nothing. Specifically discussing the present situation in the oilfields, he stated that in his judgment (1) all public oil lands on which no locations had been made should remain in Government ownership; (2) that where locations had been made prior to withdrawal and development had been carried on under existing rules, patents should be granted; (3) aside from these cases the withdrawals ought to be maintained in order to get improved legislation; (4) the new law should provide for, *a* prospecting permits securing undisputed possession for three years if need be while making discovery, *b* for grant of title on discovery to last twenty-five years, or longer, if need be, at a royalty sufficiently low not to discourage development; (5) in event such legislation could not be obtained withdrawals in areas where there were Southern Pacific lands should be vacated as likely to be more beneficial to the railway than the general public; (6) that the Government would fail in its duty if it did not exhaust every legal means to recover title to mineral lands now held by the Southern Pacific in the oilfields. His speech was well received being evidently much less radical than had been anticipated. Through Tuesday the discussion of the oil land situation was continued with S. C. Graham and T. A. O'Donnell as leaders respectively of the Progressives and Standpatters.

The Union Oil Co. is adding two 70-hp. boilers to its main water station at Hazelton; a 6-in. main will carry water to the different centres of operation. A 6-in. water system will be carried through the west side properties. A battery of three 70-hp. boilers is being installed on the Sage property to handle the output of the two water wells recently brought in. The Union company is working between 400 and 500 men on the west side. Owing to the full storage and small runs, development work in the Kern River field is not being pushed. New work is being delayed until conditions become better. The Kern Westside Oil Co., operating on the western edge of the Kern River field, has a well down 400 ft. with 16-in. casing. Although this vicinity has been prospected at shallow depth without favorable results, the officials of the Kern Westside company believe that oil will be found if sufficient depth is attained. The Ethel D. Co., at Maricopa, brought in two gushers last week. After spouting for a few hours the wells, No. 6 and 9, settled down to a flow of 700 to 1200 bbl. per day respectively. The Western Minerals Co., owning about 4000 acres of oil lands directly south of Maricopa, recently brought in a well at 1650 ft., the oil being a fine light product testing 31°. This is the lightest grade oil encountered in the Midway-Maricopa field. The first sand in this well was encountered at 1120 ft., the oil testing 19°; the second sand was encountered at 1340 ft., at which depth the oil tested 24°. The discovery of the third sand, yielding the light oil, has produced something of a boom in the district.

S. A. Guiberson, Jr., a member of the executive committee of the Oil Producers' Agency, is quoted as stating that every effort is being made to sell Agency oil, and that if the proper price can be had from the Associated, the product will go to that marketing company. Mr. Guiberson stated also that he could see no reason why the Western Oil Producers' Association and the California Oilmen's Association should not be consolidated, now that the dissension in the ranks of the former organization has been overcome.

The smelter of the Clara Consolidated Gold & Copper Mining Co., at Swansea, Yuma county, Arizona, has again been blown in. The management states that everything now favors continuous operation. An ample supply of ore is developed at Swansea and about two carloads is being received weekly from the Mudersbach property south of Bouse. This property was recently purchased by George Mitchell, president of the Clara company. Advice has been received at the Clara offices that the company has been awarded two first prizes at the Brussels Exposition; one for its mineral exhibit and one for the model of the smelting plant. The United Mines Co. will within the next 30 days begin operations on what was formerly known as the Golden Cross mines, at Tumco, Imperial county, California. The company is now awaiting the completion of a 6-in. pipe line from the Colorado river; this will be 12 miles long when completed. The property is equipped with a 40 and a 100-stamp mill. At the start only 50 stamps will be operated. The ore is free-milling, and for the present no cyaniding will be attempted; later, however, after the completion of extensive experiments, a cyanide annex may be erected.

General Mining News

ARIZONA

COCHISE COUNTY

Work at the Cole shaft of the Superior & Pittsburg Copper Co. continues. Crews on the South Dip ore ground has been stoped to the surface, and most of the miners transferred to the other properties of the company. The Calumet & Arizona in the Courtland district has also suspended for the time being.——Churn drilling on the second hole of the Great Western company has been started.

GILA COUNTY

(Special Correspondence.)—The local management of the Little Miami Copper Mines Co. is expecting orders to begin development at the inclined shaft on the 17 claims bought some months ago from the Cole Development Co. and situated 15 miles west of Miami. In the Cole mine there is much ore of both high and low grade exposed and the dump at the main shaft contains 3000 tons of ore averaging 4% copper. Unwatering the shaft and lower level has been commenced. Richard Fleming is superintendent and general manager.——E. C. O'Keefe, a director in the newly organized Globe, Arizona, and El Paso Mining & Smelting Co., arrived in this district September 21 to take up options held by the company on 44 claims five miles north of Miami, near Sleeping Beauty mountain. According to the terms of the options development must be started by October 1, 1910, and $25,000 must be expended in operations within one year.——Stockholders of the Live Oak Development Co., in a meeting held at Bisbee, agreed to increase the directorate from five to nine. The change will be made within 30 days, or as soon as the necessary amendment to the constitution can be prepared and published. Among the additional directors will be George J. Maas, of Negaunee; George F. Ruex, of Ishpeming, Mich.; and George Piper, of Duluth, Minn. So far as can be ascertained from the management in this district, the Inspiration Copper Co. has not yet selected a site for its proposed 5000-ton concentrator. The initial tests of ore will be commenced in the experimental mill within three weeks.——W. B. Eaton, president, and C. W. Pritchett, general manager of the Cactus Copper Co. and the Summit Mining Co., are in Miami district inspecting both mines.

Miami, September 24.

MOHAVE COUNTY

(Special Correspondence).—George Mitchell, president and general manager, reports from Swansea that the operation of the Clara Consolidated Gold & Copper Mining Co.'s smelter will be resumed after a shut-down for repairs and additions.

Los Angeles, September 24.

(Special Correspondence).—Shipments of gold bullion from the Gold Road and Tom Reed mines this week set new records of production for these properties. The Gold Road output was valued at $30,000 and represents 9 days' run, and two bars of gold from the Tom Reed, weighing 250 lb., worth a little over $50,000, are the result of a three weeks' run. At the Tom Reed with the recent addition of another tube-mill, the average amount of ore treated is less than 60 tons per day. At the Gold Road two more Chilean mills and another compressor are nearly in place but will not be put into operation until more power is available at the Kingman plant. With the new Chilean mills and changing from sand leaching to sliming and filtration the mill is expected to treat 300 tons daily. It is estimated that there are 100,000 tons of ore broken in the stopes and about five years' supply blocked out in reserve. The Tom Reed has about two years' run in reserve and the new work on the 500-ft. level is proving a large and rich orebody. All ore milled to date has averaged a little over $40 per ton and that now being treated is better than $60 ore. In the Ruth mine, in Silver Creek district, a new working shaft has been started 400 ft. west from the main shaft. Dan Bosqui, mill superintendent of the Gold Road, has completed a [illegible] of cyanide tests of the Lee [illegible] and Mc. Vey Deposits [illegible] Los Angeles [illegible] the [illegible] of a mill and cyanide plant [illegible] the Gold Road works in Union Pass district. A group of [illegible] owned by Holmes & Warner at Silver Peak [illegible] west from Union Pass, has been bonded to Lee [illegible] & Dyer of the Goldfield Round Mountain Mining Co. These men are sinking a shaft. L. R. Scott is superintendent. Good headway is being made in the erection of the 100-ton mill and cyanide plant at the Tracedy mine, owned by the Prisco Mines & Power Co., and it should be in operation by November 1. Marshall D. Draper of Denver has been examining prospects in this district and in the Cerbat range for Colorado men. Concrete foundations for another unit to the local power plant, doubling its capacity, are completed and the work of erection started. The management expects to have the additional equipment running by the first of the year.

Kingman, September 22.

PINAL COUNTY

The main shaft of the old Silver Queen property, at Superior, is down 700 ft. and a station is being cut. The shaft is vertical and as soon as the station is completed a crosscut will be started for the vein which is about 300 ft. north of the shaft at this depth.——A prospect shaft at the Carney claims in the Superstition mountains is down 15 ft. exposing a 2 ft. vein that assays $27 gold with 17% copper.

YUMA COUNTY

Active work is under way at the Wardell-Osborne property east of Parker and the road to town is being put in good condition so ore may be shipped to the Swansea, or Needles, smelter at an early date. There are a number of good showings on the claims, considerable of the development having been done in ore.

CALIFORNIA

AMADOR COUNTY

(Special Correspondence).—The Amador Keystone Gold Mining Co. (M. Jasper McDonald), has asked the court to appoint a receiver for the California Consolidated Mines Co., which at present controls the Keystone group of mines at Amador City, and the Wildman-Mahoney group at Sutter Creek.——The Alpine mine, situated in the northern part of the village of Plymouth, and which was worked more than twenty years ago, is being reopened. The former operators worked to a depth of several hundred feet. This new enterprise is having a stimulating effect on the mining industry in northern Amador county.

Jackson, September 24.

LASSEN COUNTY

Nearly all of the force of 150 men at the Hayden Hill mines (Golden Eagle group), have been laid off, and it is now reported that little work will be done before next spring.

NEVADA COUNTY

(Special Correspondence).—The North Star Mines Co. has purchased the Pratt and Dubuque claims, which adjoin the North Star holdings, and comprise four acres. The company is vigorously developing its claims on Cincinnati Flat and opening considerable territory. At the main Central workings the usual work is progressing from the lower levels. The company recently declared its third dividend for the year, amounting to $100,000. At the Empire the construction of the cyanide plant is rapidly nearing completion. Developments are satisfactory in the mine, and 40 stamps are operating constantly. It is understood that monthly production is running $50,000 to $75,000.——The recently opened orebody at the Pennsylvania continues to show a good grade of quartz.——The raise from the adit at the Jenny Lind appears to be near the channel.——A compressor has been installed at the Andy Fitz, near Moore's Flat, and 1200 ft. of flume and 800 ft. of pipe completed.——It is possible that operations may be resumed at the Conlan mine before the end of the year. H. G. A. Brunnier, the manager, expects to arrive early in October and will en-

deavor to settle the financial obligations of the company. ——Operations have been resumed at the Golden Gate.—— The recent rains have apparently eliminated all danger of a water shortage in Nevada county. Companies that were preparing to curtail operations are again operating as usual.

Grass Valley, September 26.

The North Star Mines Co. paid its third dividend of 4% recently, making a total of $300,000 thus far this year. The company is constructing a number of concrete sets that will be placed in the shaft and in the drifts of the mine. The timbers will be allowed 30 days on the surface to set before being placed in the mine.——A number of stockholders visited the Cassidy mine in the Grass Valley district and have expressed themselves as being well pleased with the progress in development.——Considerable trouble is being experienced at the Prudential in obtaining a steady supply of power and it is thought that it will take over a month to unwater the shaft.——The recent high water on the Yuba river flooded the channel at the Golden Dream workings stoping the work temporarily. These are being pumped out and operations will be continued till the winter rains begin.

PLACER COUNTY

George A. Tubb has purchased the Wollaster quartz claim which adjoins the Red Bird on the west, and was at one time known as the Red Bird No. 3.——The dredge operating on Bear River has suspended operations as the ground is too deep to be economically worked by the machine as now arranged. It will be repaired and changed, so as to continue operations in the spring.

SIERRA COUNTY

(Special Correspondence).—The shaft on the Poker Flat gravel mine is down 330 ft. and into the washed gravel. A large tract of land, supposed to cover the channel, has recently been acquired by this company by location.——The Phelan brothers, of San Francisco, have started work on the Commodore group three miles south of Sierra City. The group consists of six gravel claims and the company is sinking to bedrock on the Klondyke claim. C. B. Conlin is in charge.——The litigation over the Mountaineer mine has been settled. The mine is 7 miles northeast of Sierra City, and is equipped with 10-stamp mill. J. M. Shinn, of New York, retains the mine, and C. R. Thompson and associates take all buildings and machinery on the property. The compressor, mill, and buildings are to be moved to the Colombo mine.——Work on the lower adit of the Colombo is progressing rapidly, being in 120 ft.——The shaft on the Monarch mine, under bond to C. R. Thompson, is down 75 ft. and a horse-whim is used for hoisting.—— Lessees on the Keystone mine discontinued work after the last mill run which was not satisfactory.——The Hayes Consolidated Mining Co., operating 2½ miles from Sierra City, on the Downieville road, has men opening the mine, which has been closed down for a number of years. It is equipped with a 10-stamp mill. Extensive prospecting and development will be done on the present adit level. S. J. Van Syckel is manager, and William Barker superintendent. ——The Sierra Buttes mine has 35 men at work and the 10-stamp mill is running three shifts. A 10-drill compressor has been ordered and extensive development is to be done. ——The Middle Yuba Mining Co., 10½ miles west of Sierra City, has practically finished work for the summer. This company sank through the gravel to bedrock and has driven 100 ft. along the bedrock. E. J. Hayden has charge of the work.——Bids have been advertised for by the county clerk for the construction of the road from Sierra City to Gold Lake to connect at the county line with the Plumas county road. The road will only require 7.4 miles of building, the remainder, 13 miles, having already been completed.

Sierra City, September 26.

TRINITY COUNTY

(Special Correspondence).—The 200-ton cyanide mill and power plant of the Trinity Gold Mining & Reduction Co., near Carrville, is rapidly nearing completion. Most of the machinery is installed in the mill and it is expected to be ready for operation on November 1. The company is bringing in supplies for the winter, such as lime, cyanide, and zinc dust, in anticipation of bad weather later in the fall. A combination steel and wood bridge of 126-ft. span is being erected over the Trinity river just below Carrville. This bridge will be completed in 15 days and will afford easy access to the mine in all conditions of weather. This is a private enterprise and the company received no assistance from the county or Forest Service. The work on the power plant and flume is proceeding rapidly. The flume is completed to station 6700 and only 2300 ft. remains to be finished. The work of laying this flume is proceeding at a rate of 175 ft. per day. The flume is 3 by 4 ft. cross-section and will carry 2000 in. of water. The intake pipe for the turbine is on the ground and the concrete foundations for the turbine are completed. The power transmission line is up and electricians are wiring the buildings. The company's sawmill has cut 1,400,000 ft. of lumber which has been used in construction work. This plant when finished, will be one of the most modern and complete in the State.

Carrville, September 24.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence).—E. J. Butts, manager for the Big Indian Mining Co., is employing men in constructing a road to the mine. A new adit is to be driven and machinery will be purchased.——The machinery at the holdings of the Bard Creek Mining Co. will be put in operation next Monday. Work in the lower adit will then be resumed. F. Nelson is manager.——The buildings at the Oriental adit on Lincoln mountain have been completed and the adit is advancing. James Beshears made a test shipment of 100 lb. of ore from the Esconado vein on Lincoln mountain that brought a settlement at the rate of 3.10 oz. gold to the ton. A mining engineer from Colorado Springs has been making an examination of the property during the past week.——The shaft being sunk from the Capital adit on the Aetna vein has reached a depth of 50 ft. A fine streak of ore has been followed the entire distance.——Edwin Clark, owner of the National group in West Argentine district, has men at work. The adit is being driven ahead and a streak of galena is showing that carries 75% lead.

Georgetown, September 22.

GILPIN COUNTY

(Special Correspondence).—A rich discovery has been made in the Hughesville silver district in the eastern extension of the Hard Money mine. The ore is said to be 3 ft. wide and will carry an average of 50 oz. silver to the ton. There is also a small streak of ore that mills as high as 400 oz. silver. P. J. Hughes is owner.——A shipment of ore was made last week from the War Dance mine that brought 11.60 oz. gold and 17 oz. silver to the ton.——The Sunnyside mine in the Hughesville district is being developed by the owner, P. J. Hughes. Ore is showing in the bottom of the 25-ft. shaft that is worth 150 oz. silver to the ton.——A contract has been awarded by L. Sternberger at Camp Clifford to drive the Washington adit 600 ft.——Mitchell & Co., leasing on the Gulch mine, is shipping ore from the 420-ft. level.——The Columbia adit up Hamlin gulch is being driven steadily forward. Ore was recently encountered that shows fair value in gold and silver.

Central City, September 23.

IDAHO

BLAINE COUNTY

(Special Correspondence).—James Forester and Read E. Miller while examining the Fallert and McCowin group of mining claims on Badger creek near Clyde, found the mineral showings far better than anticipated. On the south claim of the McCowin there are numerous small veins and stringers of steel galena, which in several place shave been cut by short shafts and adits. These stringers of ore occur every few feet for a total width from 5 to 50 ft. On

the claim extending northward and running parallel to the one just mentioned there are large quantities of lead float varying in size from small pieces of steel galena to one boulder of which particular notice was taken of sand carbonate weighing in the neighborhood of 500 lb. This is all in a radius of 150 ft. and is considered an exceptional surface showing. The Fallert property is a promising prospect. there is a 60 ft. drift on the vein which is five feet wide on the surface. 30 ft. in there is a shoot of ore. Mr. Forester and Mr. Miller have been operating the Fallert claims for several months though considerable repair work had to be done before development could be commenced. The drift has been driven 50 ft. farther, there is a car load of high grade ore on the dump, and several more have been blocked out preparatory to shipping. They expect to make the first shipment within ten days and continue shipping all winter. Recently a new drift has been commenced 75 ft. below adit A and a shoot of high grade lead silver ore three feet wide has been opened that extends the full length of a 40 ft. winze. At present there are only 10 men at work on the property, but as soon as development is begun on the McCowin claims this force will be increased considerably. Good progress is being made in the construction work, the dormatories and other surface buildings are nearing completion. A surface orechute, flume, dam, and washer were completed some time ago.

Clyde, September 23.

BOISE COUNTY

(Special Correspondence).—The concentrating and magnetic separating plant of the Centerville Mine & Milling Co., at Centerville, was destroyed by fire two weeks ago, and it is given out that the plant is to be rebuilt. The work here was recovering monazite from old placer tailing along the streams.

Centerville, September 22.

ELMORE COUNTY

(Special Correspondence).—The Atlanta Mines Co., owner of the Monarch mine and mill at Atlanta, is controlled by T. N. Barnesdall, of Pittsburg, Pa. Dan Kirby is general superintendent. A small force of miners has been employed on development, but now 75 to 100 men are being put on to operate mine and mill, the capacity of the latter being 150 tons per day. After some changes the milling plant now provides for coarse-roll crushing, pulverizing in 5 Huntington mills, amalgamating on plates below the Huntingtons, concentrating on Johnston vanners. The concentrate is roasted and treated by cyanidation. By amalgamation a recovery of 25 to 30% of the gold and silver is made; concentration effects a reduction of 40 to 1, the product containing 5 to 6 oz. gold and 100 oz. silver per ton, in iron pyrite and pyrrhotite. Cyanidation is performed in ordinary leaching vats. The ore contains over 90% silica. By adopting this method the haulage of concentrate to the railroad at Mountain Home, a distance of 80 miles, will be avoided. One feature of the equipment is an aerial tramway, 9800 ft. long, which is said to be in good order. The Minerva mine and mill, situated close to Atlanta, are operating successfully; the ore being free-milling, is treated in a 20-stamp mill with amalgamating plates.

Atlanta, September 22.

(Special Correspondence).—John F. Leland has returned to Spokane from an inspection of the Idaho Gold & Radium Mining Co.'s property in the Leonia district and says the company has 640 acres of gold-bearing gravel with sufficient water to work four nozzles. The average depth of gravel exceeds 150 ft., and tests give from a few cents to $1.60 in gold per cubic yard. There are also three gold-bearing veins, ranging from 2 to 15 ft. in width, which are thought to be the source of much of the gold in the gulch. Ore shipped from an extension of one of these veins by the carload returned $160 per ton in gold and copper. There is timber enough to meet all present demands. A sawmill will soon be in place. The property can be worked seven months in the year. It is within half a day's ride of Spokane and within an hour's ride of a rail way station.

Spokane, September 23.

SHOSHONE COUNTY

(Special Correspondence).—M. Baumgartner of Spokane president of the Liston Mining Co., reports reconstruction of the camp in the Coeur d'Alene proceeding rapidly. A blacksmith shop and quarters for the men are under way and a compressor house will follow. A compressor and machine drills will be installed. In the meantime hand drills are being used.

Wardner, September 22.

NEVADA

ELKO COUNTY

(Special Correspondence).—The 4-M lease has shipped two wagon loads of high grade ore. They have been trying for several weeks to have this ore taken out, but none of the ranchers would haul any ore for less than $50 per ton, for the 90 miles' haul to the railroad. This high rate for freight either in or out of the camp is one of the things that is holding the camp back. The Jarbidge Commercial Club has taken up the matter of building a road to the south to connect with the Southern Pacific and Western Pacific at Deeth. An engineer reports that it is feasible to build this road and that it will give the camp a 65 mile haul to the railroad. From Charleston to Deeth there is a fine road over which autos can make the run in two to three hours. This road will give the camp much lower freight rates, and supplies can be bought much cheaper at Deeth or Elko than at Twin Falls. Work will be pushed on this road so that the camp may have winter communication with the outside as the Twin Falls road cannot be used to advantage during the winter. The new road will permit autos to come into camp and will be available for transporting heavy machinery. Besides the 4-M lease, there are several other properties which have shipping ore, the Bluster, Rock Creek, and Success claims near the Pick and Shovel; the Altitude, Windy, and Victoria claims in the Second Crater; the Arkansas in the Third Crater; and the Windy Point in the Fifth Crater. The Good Luck tunnel is in 50 ft., running along the hanging wall of the vein; another 50 ft. will bring them under the outcrop. The vein shows good average value with high-grade spots and streaks of iron pyrite. An opening has been made on the vein across the gulch where it shows 9 ft. wide. The Amazon-Rainbow adit is in 80 ft., and a car and track were recently put in. It has 50 ft. to run to cut the main vein; the small cross-vein which was being followed took a sharp turn to the south out of the tunnel and they are swinging the tunnel to get back to it. When they encounter the main vein it will be at a depth of 125 ft. The Pavlak tunnel is in 380 ft. and the character of the rock indicates that the vein is not far away. This tunnel will tap the vein at a depth of 400 ft. and from the showing in the shaft above and in the two leases on each side there is reason to believe that the vein will be large and rich on this level. The Clark-Fletcher lease on the North Star has the lower tunnel in 160 ft. and the presence of numerous small seams of quartz which pan well, indicates that they are near the vein. This tunnel is 100 ft. below the Bourne tunnel. Mr. Fletcher says that if the vein shows as well on this level as above, he will put in a mill. W. W. Williams has opened the vein in three places on the Red Bird claim, it shows from 4 to 6 ft. wide and pans well in free gold. This vein is 600 ft. east of the Pavlak vein and can be traced across the Joe and Guess claims into Bonanza gulch. The Rock Creek vein in 15 ft. has increased from 6 in. to over 2 ft. and the ore pans as well as any in the camp. The Bluster-Mint-Scenic case is on trial in the Elko court. This vein has the best showing yet opened, both as to size and value of the ore. Two tons of high-grade ore have been sacked with practically no work going on. With uninterrupted work this mine would soon be a shipper. The Stray Dog and Red Rooster claims in Gorge gulch are beginning to show good value. These claims are just

over the ridge southerly from the Bluster and on the same vein, which can be traced south across Snowslide gulch. The Arkansas vein, in the Third Crater, over the saddle at the head of Snowslide, has widened to 5 ft. The whole vein pans well and there is some high-grade ore. The Ozark vein south of Dry gulch which shows an average of $4 for 25 ft. in width has been opened by a short adit and the value has increased to $9 in the adit. The Estes claim on the west side of the river, a short distance south of the Amazon, is being opened by the Jarbidge Estes Mining Co. The vein is several feet wide and 15 in. on the hanging wall side pans well. The Tacoma company, west of town is preparing for steady work. It has one of the largest outcrops of quartz in camp. The shaft is down 40 ft. and the adit is in the same distance. They are driving to open the vein at a depth of 100 ft. when they expect to have sufficient ore exposed to warrant the erection of a mill. The National claim has an adit in 100 ft. with 50 ft. farther to run to cut the vein at 90-ft. depth. The camp has heretofore had no regular mail service.

Jarbidge, September 24.

LYON COUNTY

(Special Correspondence).—The Mason Valley Mines Co. has engineers at work on preliminaries for its smelting plant at Wabuska. Grading for foundations is in progress, and a railroad spur is being built to the site. The work of designing the plant has been going on for some time in the Salt Lake office of J. Labarthe, who is at the head of the company's smelting department. Mr. Labarthe states that the initial plant will have a sampling mill with a capacity of 100 tons per hour, two blast-furnaces, each 44 in. by 25 ft., and two stands of converters. It is also probable that a small reverberatory will be built for the purpose of smelting the fine ore and flue dust. It is anticipated the Mason Valley mine will supply from 400 to 500 tons of ore daily to the plant, and the Nevada-Douglas company is under contract to supply 350 tons per day. Both mines are in the Yerington district, which has been frequently described in this paper.

Salt Lake, September 24.

NYE COUNTY

(Special Correspondence).—The 100-ton mill of the Bonnie Clare Co. is in operation. In addition to the quartz coming from the Rattlesnake and Corbett mines of this company, a fair amount of custom ore is being treated.——The various leases on Tramp Con. are making steady shipments of rich ore. The veins on the Denver claim are showing well.——Most of the suits affecting mining companies at Manhattan have been stricken from the court calendars in accordance with the request of the warring interests. In practically every instance owners are showing a disposition to settle their differences out of court. The settlement of litigation by the Dexter, Jumping Jack, and Stray Dog companies has had a good effect on local conditions.——A vein of free-gold quartz has been opened in the northern part of Manhattan district by T. Baker, John Sherman, and James Desmond, surface work showing ore running over $20 per ton.——At Tonopah the enlargement of the Belmont shaft to three compartments has been completed from surface to the 1100-ft. point. A temporary hoist has been installed and guides are being placed in position. It is expected to have the new hoist in operation about the middle of October. The new ore-bins have been completed and covered with corrugated iron.——At the Tonopah Extension stoping is under way at the 400, 500, and 600-ft. levels. A cross-cut is being run on the 500-ft. level to intersect the orebodies developed above.

Rhyolite, September 21.

UTAH

BOX ELDER COUNTY

(Special Correspondence).—The Salt Lake Copper Co., under the management of W. B. Fisher, is shipping 140 tons per day of iron ore to the plant of the U. S. Smelting, Refining & Mining Co., at Midvale, for use as flux, and at present is mining no copper ore. The iron ore (hematite), is taken from vein outcrop.

Salt Lake, September 23.

SUMMIT COUNTY

(Special Correspondence).—The American Exploration Co., controlled by F. V. Bodfish and associates, of Colorado, has taken a 5-year lease on the American Flag mine at Park City, and has begun operations with 15 men, under direction of Mr. Bodfish. The lease was given by George H. Rathman and associates.

Salt Lake, September 23.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—With shipments during the past week amounting to 1300 tons of ore the Rawhide mine, at Phoenix, controlled by the British Columbia Copper Co., started shipping to the Greenwood smelter. Shipments will be gradually augmented and it is expected that 150 men will be employed in the course of a few months. The buildings now going up to replace those recently burned at the No. 3 adit of the Granby mines, are of brick, steel, and cement. The shipments of ore from the Granby mines during the last two weeks have dropped below the normal amount during the year, because the company has decided to curtail output until such time as the copper market strengthens. Jay P. Graves, of Spokane, general manager for the Granby company, has gone to New York to attend the general meeting of the company there October 4. Things are progressing well at the No. 7 mine of the Consolidated company at Central camp, and it is expected that the mine will be on a shipping basis some time next month. It is rumored that the Consolidated company is looking for mines on the west fork of Kettle river, where there are some good copper properties.——Work has been started on the Princeton-Chilliwack Coal Co.'s property at Princeton. A shaft 4½ by 7 ft. will be sunk. The ore shipments from the Boundary district for the week ended September 17, and for the year to that date, were as follows:

Mine	Week, Tons.	Year, Tons.
Granby mines	16,530	839,959
Jackpot	618	8,258
Mother Lode	8,653	254,453
Nickel Plate (concentrate)	38	539
Rawhide	1,300	1,300
Snowshoe	2,125	116,091

Phoenix, September 22.

(Special Correspondence).—The shipments of ore and concentrate from the Slocan-Kootenay mining district for the week ended September 17 and for the year to that date were as follows:

Mine.	Week, Tons.	Year, Tons.
Emerald	34	1,362
Enterprise	23	44
Highland (concentrate)	45	147
Queen (concentrate)	39	505
Richmond-Eureka	22	3,054
Ruth	36	422
St. Eugene (concentrate)	150	11,226
Sullivan mine	937	12,350
Slocan Star	30	30
District mills	4,500	187,800

Nelson, September 22.

(Special Correspondence).—N. Hanson, the lessee of the Mayflower mine in the South Belt, has opened two veins. The property looks promising. Work is progressing steadily on the Consolidated group and shipments are up to normal. While heavier shipments could be made the management is inclined to keep them low with the copper market in its present condition. Two new veins have been opened in the Iron Mask mine of this group. The Granby company will soon be in a position to commence work on the Cliff property.

Rossland, September 22.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

R. F. [illegible] is now at Republic, Washington.

R. H. Lee has returned to New York from Cuba.

F. R. Lovejoy has returned to Berkeley from Siberia.

J. D. Hoffman has returned to San Francisco from the East.

Arthur G. Blake has left San Francisco for Nome, Alaska.

W. H. Storms has returned to San Francisco from a trip to Colorado.

Howard Bancroft is in Arizona engaged in geological work at Ray.

H. W. Turner is in Chosen (Korea), Japan, examining copper mines.

Bertram Hunt has returned to San Francisco from British Columbia.

Dyke V. Keeby is in Nova Scotia making examinations of copper property.

Carl F. Dietz has left Boston for Colorado and New Mexico mining districts.

Morton Webber has returned to New York after a two months' vacation in Europe.

Marshall B. Draper, of Denver, was recently in Mohave county, Arizona, inspecting mines.

Athol F. McEwen, of Duluth, Minnesota, is in California, making mine examinations.

K. Tsujimoto is visiting smelting plants in this country and will be in New York October 15.

J. B. Tyrrell, of Toronto, Canada, returned on the *Mauritania* from a short visit to London.

K. C. Parrish has returned from Colombia, South America, and will be in Des Moines, Iowa, until November 1.

Henry B. Hovland, of Duluth, Minnesota, was recently in Globe, Arizona, where he has large interests, being president of the Live Oak company.

W. H. Radford has left Siberia and will arrive in San Francisco about the middle of October. The sympathy of his many friends is extended to him in his recent bereavement, the death of his son at Los Angeles.

T. H. Jenks and W. T. Dumbleton have entered into partnership as consulting mining engineers with offices in the McPhee building, Denver, Colorado. Mr. Jenks is temporarily at White Pine, Gunnison county, Colorado. Mr. Dumbleton sailed for England on professional business September 7, on the *Lusitania*.

The San Francisco Section of the Mining and Metallurgical Society will tender a complimentary subscription dinner to J. A. Holmes, the newly appointed director of the U. S. Bureau of Mines, at the Palace Hotel, October 6.

The Prospector

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

H. W., Rhyolite, Nevada: No. 1, hornblende gneiss or amphibolite; No. 2, crystalline limestone with limonite; No. 3, schist with a small amount of pyrite; No. 4, granite coated with a thin layer of dolomite; No. 5, granite.

E. A. G., Fort Bidwell, California: The rose and amethystine shades of quartz have been generally ascribed to the presence of minute quantity of manganese. It has been discovered that titanium will also produce violet tints, and since both of these elements are rather prevalent in silicious rocks the purple color of the specimen may be due to either. It is not an indication of any precious metal.

Market Reports

LOCAL METAL PRICES

San Francisco, September 29

Antimony	12–12½c	Quicksilver, flask	[illegible]
Electrolytic Copper	14½–15c	Spelter	7–7½c
Pig Lead	4.70–5.00c	Tin	37½–39c

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead	Spelter	Silver, per oz.
Sept. 22	12.90	4.40	5.54	58⅝
" 23	12.90	4.40	5.54	58¼
" 24	12.90	4.40	5.54	58⅛
" 25	Sunday.	No market		
" 26	12.90	4.40	5.54	58¼
" 27	12.90	4.40	5.54	58⅛
" 28	12.90	4.40	5.54	58⅜

ANGLO-AMERICAN SHARES

Cabled from London

	Sept. 22. £ s. d.	Sept. 28. £ s. d.
Camp Bird	1 12 0	1 12 0
El Oro	1 7 0	1 7 3
Esperanza	2 18 0	2 11 3
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 6	0 7 0
Mexico Mines	9 13 9	7 17 6
Tomboy	0 16 3	0 16 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Sept. 29.		Closing prices, Sept. 29.
Adventure	6	Mohawk	46
Allouez	41	North Butte	26¼
Atlantic	6	Old Dominion	36
Calumet & Arizona	67½	Osceola	122
Calumet & Hecla	543	Parrot	12½
Centennial	17	Santa Fe	1¼
Copper Range	60	Shannon	9¾
Daly West	4	Superior & Pittsburg	11
Franklin	10½	Tamarack	56
Granby	32	Trinity	5
Greene-Cananea, ctf.	8⅛	Utah Con	22
Isle-Royale	20⅛	Victoria	2⅛
La Salle	9½	Winona	7
Mass Copper	7¼	Wolverine	112

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Sept. 29.		Closing prices, Sept. 29.
Amalgamated Copper	62⅜	Miami Copper	19⅜
A. S. & R. Co	66⅞	Mines Co. of America	9/16
Braden Copper	35⅛	Montgomery-Shoshone	¼
B. C. Copper Co	6⅝	Nevada Con	19⅛
Butte Coalition	18¼	Nevada Utah	¾
Chino	18½	Nipissing	11
Davis Daly	2	Ohio Copper	1⅝
Dolores	5¾	Ray Central	2
El Rayo	32½	Ray Con	18⅜
Ely Central	¼	South Utah	1⅞
First National	3¾	Superior & Pittsburg	11¾
Giroux	6⅜	Tenn. Copper	31⅝
Guanajuato Con	¾	Trinity	5¼
Inspiration	7⅞	Tuolumne Copper	8¼
Kerr Lake	6¼	United Copper	43¾
La Rose	3⅞	Utah Copper	45¼
Mason Valley	9⅛	Yukon Gold	3¾

COMSTOCKS

San Francisco, September 28.

Alpha	$ 3	Hale & Norcross	$ 25
Alta	10	Julia	7
Andes	10	Justice	10
Belcher	60	Kentuck	12
Brunswick Chollar	25	Mexican	1.62
Brunswick Potosi	24	Occidental	42
Bullion	9	Ophir	1.15
Caledonia	29	Overman	60
Cassidy	24	Potosi	45
Challenge Con	21	Savage	20
Chollar	12	Scorpion	7
Confidence	54	Seg. Belcher	14
Con. Imperial	2	Sierra Nevada	16
Con. Virginia	1.00	Silver Hill	6
Crown Point	67	Union	34
Exchequer	20	Utah	5
Gould & Curry	11	Yellow Jacket	57

(By courtesy of San Francisco Stock Exchange.)

SOUTHERN NEVADA STOCKS.

San Francisco, September 29.

Atlanta	$ 12	Mayflower	$ 5
Belmont	4.22	Midway	20
Booth	11	Montana Tonopah	98
Columbia Mtn	5	Nevada Hills	2.40
Combination Fraction	36	Pittsburg Silver Peak	47
Daisy	3	Rawhide Coalition	10
Fairview Eagle	40	Rawhide Queen	—
Florence	2.20	Round Mountain	45
Goldfield Con	8.87	Sandstorm	5
Gold Kewenas	8	Silver Pick	8
Great Bend	3	St. Ives	20
Jim Butler	29	Tonopah Extension	1.02
Jumbo Extension	40	Tonopah of Nevada	8.75
MacNamara	28	West End	53

(By courtesy of San Francisco Stock Exchange.)

OIL SHARES

San Francisco, September 28.

Alma	$ 1.00	Occidental	$ 20
Apollo	10	Palmer	1.30
Associated Oil	42.12	Paraffine	1.00
Bay City	2.25	Pinal	6.25
Brookshire	1.54	Premier	80
Caribou	14.87	Record	6.00
Claremont	1.60	Republic	46
De Luxe	90	Sauer Dough	1.90
Empire	3.00	Silver Tip	1.25
Enos	1.05	S. W. & B.	31
Fulton	1.62	Sterling	2.25
Illinois Crude	42	Turner	1.15
Jade	20	Wolverine	20
Monte Cristo	2.52	W. K. Oil	2.25
Nevada Midway	16	Yellowstone	30

(By courtesy of San Francisco Stock Exchange.)

CURRENT PRICES FOR CHEMICALS

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as specified. For round lots lower prices may be expected, while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min.	Max.
Acid, sulphuric, com'l, 66°, drums, 100 lb	$0.90	$1.25
Acid, sulphuric, com'l, 66°, carboy, 100 lb	1.00	1.50
Acid, sulphuric, C.P., 9-lb. bottle, bbl., lb	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb	0.09½	0.12
Acid, muriatic, com'l, carboy, 100 lb	1.60	2.00
Acid, muriatic, C.P., 6-lb. bottle, bbl., lb	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb	5.25	6.50
Acid, nitric, C.P., 7-lb. bottle, bbl., lb	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb	0.12½	0.15
Argols, ground, bbl., lb	0.20	0.25
Borax, cryst. and conc., bags, 100 lb	2.75	3.85
Borax, powdered, bbl., 100 lb	3.00	4.00
Borax glass, ground, 30 mesh, kegs, 100 lb	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb	4.50	5.50
Bromine, 1-lb. bottle, lb	0.55	0.65
Candles, adamantine, 12 oz., 40 sets to case	3.50	4.15
Candles, adamantine, 14 oz., 40 sets to case	4.00	4.55
Candles, Stearic, 12 oz., 40 sets to case	4.95	5.50
Candles, Stearic, 14 oz., 40 sets to case	4.65	5.20
Clay, fire, sack, 100 lb	1.50	2.00
Cyanide, 98 to 100%, 100-lb. case, lb	0.20¾	0.24¾
Cyanide, 98 to 100%, 200-lb. case, lb	0.20	0.24
Cyanide, 125 to 127%, 100-lb. case, lb	0.27½	0.28½
Cyanide, 125 to 127%, 200-lb. case, lb	0.26¾	0.27½
Lead acetate, brown, broken casks, 100 lb	8.75	9.00
Lead acetate, white, broken casks, 100 lb	10.00	10.25
Lead acetate, white, crystals, 100 lb	11.75	12.25
Lead, C.P., test., gran., 100 lb	13.00	15.00
Lead, C.P., sheet, 100 lb	15.00	18.00
Litharge, C.P., silver free, 100 lb	10.50	13.00
Litharge, com'l, 100 lb	7.00	8.50
Manganese ox., blk., dom. in bags, ton	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton (85% MnO_2—¾% Fe)	45.00	50.00
Mercury, 75-lb. flask	46.00	47.50
Nitre, double ref'd, small cryst., bbl., 100 lb	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb	7.25	18.00
Potassium bicarbonate, cryst., 100 lb	12.00	15.00
Potassium carbonate, calcined, 100 lb	15.00	18.00
Potassium permanganate, drum, lb	0.11	0.12½
Silica, powdered, bags, lb	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb	1.50	1.75
Soda, bicarbonate, bbl., 100 lb	2.00	2.50
Soda, caustic, ground, 98%, bbl., 100 lb	3.15	3.50
Soda, caustic, solid, 98%, bbl., 100 lb	2.65	2.85
Zinc dust, 1400-lb. casks, 100 lb	8.75	9.75
Zinc shavings, 800 fine, bbl., 100 lb	10.50	11.50
Zinc sheet, No. 9—18 by 84, drum, 100 lb	9.50	10.50

CURRENT PRICES FOR ORES AND MINERALS

(Corrected monthly by Atkins, Kroll & Co.)

The prices are approximate, subject to fluctuation, and to variation according to quantity, quality, and delivery required. They are quoted, except as noted, f.o.b. San Francisco.

	Min.	Max.
Antimony ore, 50%, per ton	$25.00	$35.00
Arsenic, white, refined, per lb	0.03	0.03½
Arsenic, red, refined, per lb	0.08	0.09
Asbestos, according to length and quality of fibre, per ton	100.00	350.00
Asbestos, lower grades, per ton	10.00	100.00
Asphaltum, refined, per ton	15.00	20.00
Barium carbonate, precipitated, per ton	42.50	45.00
Barium chloride, commercial, per ton	42.50	47.50
Barium sulphate (barytes), prepared, ton	20.00	30.00
Bismuth ore, 10% upward, per ton	75.00	upward
Chrome ore, according to quality, per ton	5.00	15.00
China clay, per ton	15.00	20.00
Cobalt metal, refined, f.o.b. London, per lb	2.50	
Coke, foundry, per 2240 lb	15.00	17.50
Diamonds:		
Borts, according to size and quality, per carat	2.00	15.00
Carbons, according to size and quality, per carat	75.00	100.00
Feldspar, per ton	5.00	25.00
Firebrick:		
Bauxite, per M	175.00	200.00
Magnesite, per M	200.00	250.00
Silica, per M	47.50	
Flint pebbles for tube-mills, per 2240 lb	15.00	25.00
Fluorspar, per ton	8.00	15.00
Fullers earth, according to quality, per ton	10.00	30.00
Gilsonite, per ton	32.50	45.00
Graphite:		
Amorphous, per lb	0.01	0.02½
Crystalline, per lb	0.04	0.13
Gypsum, per ton	2.50	5.00
Infusorial earth, per ton	5.00	15.00
Magnesite, crude, per ton	5.00	7.50
Magnesite, dead calcined, per ton	22.50	27.50
Magnesite, brick (see firebrick).		
Manganese ore, oxide, crude, per ton	10.00	25.00
Manganese, prepared, according to quality, per ton	45.00	125.00
Mica, according to size and quality, per lb	0.05	0.30
Molybdenite, 95% MoS_2, per ton	400.00	500.00
Monazite sand (5% thoria), per ton	150.00	200.00
Nickel metal, refined, per lb	0.45	0.60
Ochre, extra strength, levigated, per lb	0.02½	0.03½
Platinum, native, crude, per oz	20.00	25.00
Quicksilver, per flask (75 lb.)	45.00	48.00
Scheelite (see tungsten ore).		
Sulphur, crude, per ton	15.00	25.00
Talc, prepared, according to quality, per ton	20.00	50.00
Tin ore, 70%, per ton	400.00	450.00
Tungsten ore, 65%, per ton	525.00	575.00
Vanadium ore, 15%, per ton	100.00	125.00
Wolframite (see tungsten ore).		
Zinc ore, 50% up, per ton	15.00	20.00
Zinc dust, 90% minimum, per 100 lb	7.50	9.50
Zinc oxide, per 100 lb	7.50	8.50

JOPLIN LEAD AND ZINC PRICES.

The *News-Herald* gives the following on the lead-zinc situation in that district for the week ended September 24, 1910. There has been a strong demand for ore of all grades, the best blende selling at $48 per ton, the highest price since March 26. Many mines that had been idle have resumed operations, and others are making preparations to do so. At St. Louis spelter has fallen from $5.50 to $5.27½, which indicates that stimulated production will have a direct effect on price, though it is expected to remain at about the latter quotation. Calamine, 40%, sold for $22 to $26, the better grades going as high as $30. Lead ore remained unchanged at $54 to $56. Pig lead sold at $4.27½. Joplin shipped, blende, $44,562; calamine, $384; lead, $5995; total, $50,941. Webb City, blende, $94,458; lead, $25,141; total, $119,599. Galena, blende, $25.872; lead, $3108; total, $28,980. Quapaw, blende, $5576. Alba-Neck City, blende, $10,836. Aurora, blende, $2583; calamine, $1428; lead, $1782; total, $5793. Zincite, blende, $3780. Miami, blende, $5713; lead, $1265; total, $6978. Seneca, calamine, $720. Total of other districts, $37,625. Grand total, $353,082.

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INDEX TO ADVERTISERS, PAGE 46. PROFESSIONAL DIRECTORY, 6 26. BUYERS' DIRECTORY, PAGE 44.

Worthington Compound Packed Plunger Pump—Scranton Mine Pattern

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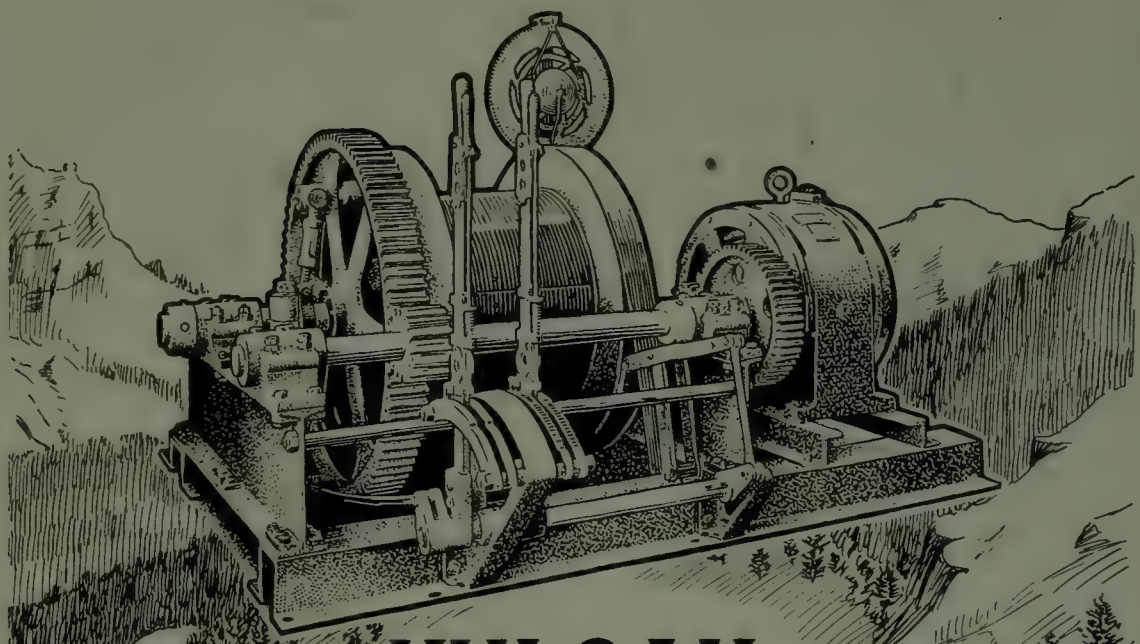

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EDITORIAL

AN examination for the position of mining engineer will be held by the United States Civil Service Commission, November 9, to furnish an eligible list for appointment to positions in the Bureau of Mines. Candidates should apply to the United States Civil Service Commission at Washington, D. C., for Form 304, which contains full information.

GOVERNORS of American States have only strictly limited authority. The 'House of Governors,' formed as a result of the famous conference at the White House, therefore can only serve as a means of promoting co-operation. It cannot legislate. Since, however, in order to win election as Governor, a man must usually be an expert in estimating and leading public opinion, this body is of great potential power. In China an equally significant movement is now under way, the Regent having recently called the Viceroys of the various provinces together in general conference. A Viceroy in China has much more authority than does an American Governor, and events may therefore be expected to proceed with greater rapidity. The calling of the conference at Peking is indicative of changing conditions and affords another analogy to American methods.

AMONG pleasant features of the week at Los Angeles were the field trips. Members of the Mining and Metallurgical Society and guests spent Saturday and Sunday inspecting the work in progress along the Los Angeles aqueduct under guidance of J. B. Lippincott and other engineers engaged in building that great work. Saturday night an elaborate dinner was enjoyed at Mojave, followed by an account of the aqueduct by Mr. Lippincott, and of tunneling methods at Loetscherberg by C. H. Richards. Monday, Tuesday, and Wednesday a large party of visitors inspected the Kern River oilfields. Throughout the week the members of the Congress and delegates were shown many courtesies by the Sierra Madre Club, the Chamber of Mines, and the citizens of Los Angeles, and all will remember the meeting as one of the most pleasant in the history of the Congress.

MINING MEN should begin now to plan for the Panama-Pacific Exposition which is to held in San Francisco in 1915. The Western States in particular should be prepared to make notable exhibits of their mineral resources, and in order to do so special efforts must be made. The systematic collections preserved in Museums will doubtless be available and will be of great service, but exposi-

tions call for another and different sort of material. The ordinary visitor is more impressed by striking and showy specimens than by those which require special knowledge for their appreciation. Even technical men are apt to be attracted to exhibits by the unusual features of the collection. Most 'specimen ores' find their way promptly to the smelter, as is right and proper, but arrangements should be made to collect in the next five years the best that are found and preserve them at least till after the exposition. It is important that mining should be well represented, and in this particular, time and forethought is quite as important as is money.

COAL MINE accidents are usually most abundant in the winter months, due partly to natural causes, such as the climatic conditions, and partly to artificial conditions contingent on the greater activity of coal mining from October to April. This year the opening of the danger season was signalized by a serious explosion at Palu, near Monterey, Mexico. It is reported that 72 miners lost their lives. In the United States and Canada steps have recently been taken to minimize the dangers of mining. In Mexico coal mining has been a minor industry, and attention has not yet been concentrated on the problem. The deplorable results of the accident at Palu will doubtless lead to the adoption of preventive measures.

ELY CENTRAL continues to be a storm centre and the trouble has entangled some who deserve better of fate. For B. H. Scheftels & Company there is scant sympathy. Their methods were of the sort that bring mining into disrepute. While their literature would not deceive any trained mining engineer, many of the statements were grossly deceptive to the class of people that they reached. The attack made on the firm by our New York contemporary, *The Engineering and Mining Journal*, attracted general attention, and the theatrical raid on the offices of the firm in New York and other cities September 29 will probably stop what the Department of Justice at Washington considers grossly illegal operations. This is a welcome effort to clean up the New York Curb and we hope it may do good. One of the stocks boomed by the firm was Ely Central. In the last year this ground has been systematically explored under direction of the Constant-Herzig Company as consulting engineers to the Ely Central Copper Company. The mine has been studied by such experts as Mr. Walter Harvey Weed and Mr. Charles S. Herzig. Recent development has borne out their theory of the geological structure of the ground and strongly confirmed the expectation of finding a large body of ore. The property itself seems about to prove valuable. A good mine, it is true, is not always represented by a good stock, and the duties of consulting engineers are hard to define. A heavy responsibility attaches none the less to a firm that continues to furnish reports, however accurate and well justified, to those who are guilty of misrepresentation. Mr. Weed is no longer connected with the property, having retired from the C. L. Constant Company some months since. Mr. Herzig has the misfortune to be related to the principal partner in B. H. Scheftels & Company. He has built up an excellent reputation by years of careful and able work. His many friends regret greatly to see him entangled in any way in the scandal, as a result of a natural though probably unwise effort to assist a relative.

METALLURGISTS will find much of interest in the program of the eighteenth general meeting of the American Electrochemical Society to be held in Chicago next week. Sessions will be held for the reading and discussion of papers in the forenoons of October 13, 14, and 15; the afternoons will be devoted to excursions, and Friday evening is to be given over to a subscription dinner at the Congress Hotel. There is much in and about Chicago to interest electrochemists and metallurgists, and many plants will be open to the visitors of the week. Among the papers to be read will be one on 'The Electric Furnace and Its Application,' by Marcus Ruthenburg; another, on 'The Application of Electrostatic Separation to Ore Dressing,' by F. S. MacGregor. Other papers of less direct interest to metallurgists are on the program and it is evident that this junior among engineering societies is attracting the support of men in a wide range of industries.

Southern Pacific Oil Lands

The oil lands controlled by the Southern Pacific railroad in California have come in for renewed interest in view of the discussion at the Los Angeles meeting of the American Mining Congress. These lands are disposed in checker-board fashion through some of the most productive oilfields and are immensely valuable. At the time they were given to the railroad company they were supposed to be agricultural and, indeed, were not thought to have much if any value. In the act of Congress granting them there was the usual provision that only agricultural lands should be selected and that if any of the allotted sections proved to be of value for minerals other than coal and iron, they should be exchanged for non-mineral lands. The whole transaction was of the sort common at that time and the policy of giving land to encourage building railroads was then well established in public favor. In a number of cases elsewhere in the West and under the terms of similar grants it is now known that there was much fraud in the classification of the lands selected and that as a matter of fact much mineral land was patented to the railroads. The courts have refused to review the findings of the Land Office as to questions of fact and have held that a classification made by authorized Government agents is binding against the Government itself, except where there is actual fraud. In such cases questions of title must be raised by the Government within six years of passage of title or the patents become valid. In the case of the Southern Pacific and the oil lands in question, no sufficient evidence of fraud has been shown; indeed it is well known that the company made repeated efforts to sell as agricultural land many pieces on which oil has since been discovered.

Aside from that, the patents having been issued in 1894, the period for action under ordinary rules has passed. It happens however that there is in this case a modifying circumstance. The patents as issued are said to have contained a clause retaining to the Government all mineral lands. This condition in the patents has not been tested in the courts, and just how important it may prove to be, cannot be predicated in advance of litigation. In view of the fact that the intention of Congress was not to give mineral lands, and that the officials of the company in accepting them evidently believed that only agricultural lands were received, there would seem to be an equitable reason for bringing the matter before the courts and restoring to the United States the title to the mineral in the ground if possible. The railroad would retain all that it bargained for, no more and no less. It is not the part of good government to unsettle titles unnecessarily, but if the title conveyed be in fact, as it seems, a restricted one, there is no injustice in enforcing its terms. It is properly a matter for the courts and we have no desire to argue the case in advance. In the interest of the railroad company, which may wish to sell the lands, as well as in the interest of the public, the matter should be tested promptly.

Dynamiters at Los Angeles

Destruction of the building occupied by the *Los Angeles Times* seems now certainly to have been the result of a deliberate plot. At first there was reason for supposing the explosion and fire to have been caused by a leaky gas pipe; but accumulating evidence, particularly the discovery of infernal machines at the residences of the proprietor and elsewhere, timed for simultaneous explosion, makes it clear that the loss of twenty-one lives and a valuable property must be charged to conspiracy. With one voice the public is demanding that the perpetrators of the outrage be hunted down and made to pay the penalty of their crime. Rewards aggregating $100,000 have been, or are about to be, offered. The deed deserves, as it has, the condemnation of every right-thinking man. There can be no acceptable excuse, and no condonation of such a crime if society is to be perpetuated. Wholesale assassination is the worst of crimes against civilization. The aroused public interest and the rewards offered are likely to lead to detection of the conspirators; already substantial progress has been made in that the circumstances under which the dynamite was purchased and shipped from a point on San Francisco bay have been made known. In this connection a word of caution is in season. The names given by the men who purchased the explosive at Giant were those of Messrs. James L. Bryson, William Morris, and Robert Leonard. These are the names of the owners of the Rawhide mine near Towle in Placer county, men of good reputation. Their names were chosen by the dynamiters in order to deceive the employees of the powder company and lend plausibility to the purchase; a plan that worked admirably. Great rewards are dangerous as well as helpful. Men who resort to dynamiting as a means of revenge are crafty and scarcely regard perjury as a crime. Circumstantial evidence has involved many an innocent man in difficulties and in times when public opinion is as now, properly aroused by a great crime, enormous rewards have a tendency to defeat as well as to secure justice. We sincerely trust that no mistake may be made. In view of the long fight made by General H. G. Otis and his newspaper against organized labor, and the bitterly contested strike that has for months past been in progress at Los Angeles, it is not unnatural to impute the dynamiting to union labor men. However natural this may be, it by no means follows that the imputation is just. It is quite true, and no one knows it better than do mine owners, that dynamite has been used in the West all too frequently as an argument in labor troubles. We are frank in our statement of belief that in instances this has been done with the knowledge and approval of officers of certain unions. We are glad to believe that such things will be exceedingly infrequent, if indeed they occur at all, in the future, and we unhesitatingly state that we do not believe that the real leaders of organized labor tolerate any such methods. Even if we could suppose them to be so inhuman as to approve of killing in mass, results have shown that the outrage reacts to defeat its purpose. The strike now in progress at Los Angeles is everywhere recognized as of the largest importance to the whole labor movement on the Pacific Coast. The men have had the support of their fellows in San Francisco and elsewhere as well as the help and guidance of the wisest and ablest of the labor leaders. It is not thinkable that they would be so foolish or so base as to sanction such an outrage. On the other hand, the fight that the *Los Angeles Times* has been making on union labor is the kind that embitters. General Otis gives no quarter. He has roused the passions of many an obscure man who is now out of work and who blames his suffering on the paper and its owner rather than on himself. Such men brood over their injuries and it would need but a few to form a band quite capable of carrying out the evident conspiracy. It will be recalled that the attempted assassination of Mr. W. J. Gaynor, Mayor of New York, was the single-handed attempt of an obscure individual, and that when McKinley was killed it proved, to the surprise of many, that there was no widespread conspiracy. We believe, and we hope it may prove, that the same is true in this case. In the meantime, as in every recent assassination in America, there is a lesson, particularly to the gentlemen of the press; bitter denunciation engenders bitterness and delays rather than forwards the mutual understanding that must precede good working conditions. Whether an editor be for or against unionism, or indeed any other movement, he will best serve his cause by moderate and informed discussion rather than by violent diatribes. Every effort should be made to capture and punish all concerned in this outrage, but let us at the same time take thought to improve conditions so that we do not multiply rather than decrease the number of dynamiters.

American Mining Congress

(Editorial Correspondence)

The thirteenth annual session of the American Mining Congress at Los Angeles, September 26 to October 1 inclusive, was notable for the position and standing of the men attending rather than for the numbers present. Not that the attendance was small; on the contrary, it was larger than at many preceding sessions, some 1200 members and delegates having registered. As is usual, there were in addition many unregistered visitors. At several sessions the Mason Opera House, in which the meeting was held, was crowded; but generally the number in actual attendance in the hall was only 200 to 300. This, however, by no means measured the interest in the meeting. It was apparent that the attendance differed materially from day to day, and evidently each visitor interspersed sight seeing with attendance on the sessions of particular interest to him. There are many attractive things to see in and about Los Angeles, and delegates cannot well be blamed for wandering.

The opening session Monday was devoted to the usual addresses of welcome and responses on behalf of the Congress and the States. Among the speakers were Alden Anderson, George Alexander, Joseph Scott, E. A. Montgomery, F. G. Tyrrell, R. W. Brock, L. W. Powell, E. H. Benjamin, D. W. Brunton, David Ross, J. W. Malcolmson, J. W. Abbott, F. J. H. Merrill, George W. E. Dorsey, John Dern, and others. In the evening E. R. Buckley delivered the presidential address, printed on another page of this issue. Mr. Buckley gave a systematic review of the work of the Congress, and his presentation of the problems yet to be met produced a deep impression. He was followed by Gifford Pinchot, whose brief address attracted more attention than any other delivered in the course of the week. It has already been brieffy noted in the *Mining and Scientific Press*. While it produced a markedly favorable impression at the time, the actual resolutions adopted by the Congress were determined by anti-Conservationists, who remained patiently 'on the job' through the week. Evidently he who speaks and runs away may need to speak another day.

Tuesday was devoted mainly to discussion of the problems of the oil men, who attended in force. It was soon evident that there was much difference of opinion as to what should be the attitude of the Government toward the petroleum-bearing public lands. S. C. Graham, who made the chief defense of the conservation policy of withdrawing the lands from entry and opening them only under some entirely new system, was clearly in the minority. He told some plain truths which were not altogether palatable, but in general the debate, while warm, was not acrimonious. Messrs. S. C. Smith and T. A. O'Donnell made the principal pleas for those who would retain the present laws with as little modification as possible. One eloquent speaker said, apropos of the activity of Eastern men in conservation matters, "We don't know what we want, but we don't want you to tell us." It must be said that the oil men are entitled to much sympathy. It was supposed when the present land withdrawal law was enacted that the interests of those who in good faith had located lands prior to withdrawal and proceeded steadily to develop them, were amply protected. The combination, however, of the withdrawal and a recent ruling to the effect that discovery must precede location, leaves them wholly unprotected. It is clear that equity demands some form of relief, and it is not surprising that oil men generally resent any movement toward extension of Federal supervision of the industry. While oil matters occupied the attention of the Congress most of the day there were also on the program addresses by J. W. Abbott, on 'Railroads and Mining Development'; by Tracy C. Becker, on 'Railroad Rates on Ore Shipments'; by E. W. Parker, on 'Conservation as It Affects Coal Lands'; and by George S. Rice, on 'Investigation of Mine Accidents.' Some of these papers are printed in this issue and others will appear later. Tuesday evening there was a reception given by the Chamber of Commerce, at which there were numerous short addresses. Wednesday, Thursday, Friday, and Saturday forenoon were devoted to papers and discussions; since reports from the Resolutions Committee had right of way, many interesting and valuable papers were read by title only. Among the most important features were the reports of the committees on 'Revision of Mineral Land Laws,' by Will L. Clark; that on 'Uniformity of State Laws and Prevention of Mine Accidents,' by J. Parke Channing; and 'Alaskan Mining Laws,' prepared by Henry R. Harriman, but read by Mr. Buckley. Wednesday evening J. A. Holmes delivered an address on 'The Bureau of Mines and Its Work,' presented on another page. This was followed by the brief addresses of S. B. Christy, David T. Day, and others. Thursday was given over mainly to discussion of the report of the Resolutions Committee on all resolutions relating to conservation. It was soon evident that the 'stand pat' element was in the majority. The resolutions recommended by the committee praised conservation in general terms, and then pronounced for State rather than Federal control and against any form of leasing. The report of the sub-committee was presented by C. F. Potter, of Denver, an attorney said to be employed by one of the large power companies. In the ensuing discussion there was a large amount of eloquence and considerable misinformation. For example, the gentleman presenting the report referred at length to early experience of the Federal Government with leasing in connection with the lead-bearing lands in the Mississippi Valley and to some of the complications that led to its abandonment. He then stated that the leasing system being abandoned and titles made secure, gold was discovered the next year in California. The fact was that when gold was discovered in California, and up to 1866, there was no legal way to get any title to public mineral land, and all miners were trespassers. Instead of security, there was the utmost insecurity of title, and yet prospecting was

fairly active. One speaker announced that what the miners wanted was the good old law under which we can make money and can lose money. Altogether there was a surprising ignorance of the actual working of the lease system which is so widely applied everywhere except in the Western American States. It is evident that if the advocates of a change are to win the day they will have to wage a vigorous campaign of education. At present the miners remember only their unfortunate mishaps with the Land Office and other Bureaus of the Government and they are jealous of any extension of Bureau control. Other resolutions adopted by the Congress congratulated Mr. Taft upon his appointment of J. A. Holmes to the position of Director of the Bureau of Mines, and pledged the support of the Congress to the new Bureau and to the Geological Survey. The action of the Bureau of Mines in making the prevention of mine accidents its first concern was endorsed; the creation of a laboratory to study the chemical and physical problems underlying modern metallurgy was advocated; the importance of keeping the Bureau and its officers out of all private work, the need of marking desert trails, the vital necessity of unrestricted prospecting on the public lands, and the advisability of the Department of Justice re-investigating title to all mineral lands passed to railroads in land grants, were also urged.

Thursday evening at the business session of the Congress, Messrs. John Dern, E. R. Buckley, E. A. Montgomery, L. W. Powell, and C. A. Barlow were elected directors, and plans for improving the financial position of the organization were discussed. At a subsequent meeting of the Board of Directors, John Dern was elected president, and D. W. Brunton, S. A. Taylor, and E. A. Montgomery vice presidents. J. F. Callbreath, Jr., was re-elected secretary. Mr. Callbreath, unfortunately, was not able to attend the sessions of the Congress, being confined to his room by ill health. We are glad to report that he is recovering rapidly. In his absence Sidney Norman officiated to the satisfaction of all. Monday evening, following the session, the Sierra Madre Club kept open house. Wednesday noon, at the Hotel Alexandria, the Directors of the Chamber of Mines gave an elaborate luncheon to the officers of the Congress and invited guests. Thursday evening the members of the Mining and Metallurgical Society of America present in the city, with a few guests, had a dinner and meeting at the Sierra Madre Club. An interesting feature of the occasion was the presence of the presidents of the three American societies devoted to mining, D. W. Brunton of the American Institude of Mining Engineers, E. R. Buckley of the American Mining Congress, and J. Parke Channing of the Mining and Metallurgical Society itself. Friday evening the Sierra Madre Club gave a smoker and vaudeville on the roof of the Hamburger building. Saturday there was a dinner and dance at the Virginia Hotel, at Long Beach, and Sunday an excursion to Catalina island. The ladies in attendance were entertained at tea Wednesday afternoon at Hotel Alexandria and given an automobile ride around the city Thursday.

Work of the Bureau of Mines

*The Bureau of Mines was created by Congress as the result of a demand coming not only from the mining industry, but also from the general public in different parts of the country. This movement for appropriate recognition and aid for the mining industry from the National Government has been under way for many years. Among its early and most active and successful supporters has been the American Mining Congress. It is, therefore, eminently appropriate that at the first session of this Congress following the creation of the new Bureau of Mines, something should be said of its policy and purpose.

The chief purpose of the Bureau of Mines is the development of greater safety and efficiency in mining. It may be expressed in another way as 'lessening the loss of life and the waste of resources' in connection with the operations of the American mining industry. Or, as expressed in a yet different way, its chief purpose is the 'conservation of the lives of the miners and the mineral resources of the country.' If, in view of the fact that the Bureau has no means of enforcing and carrying out its recommendations, the question is raised as to how it can aid in the accomplishment of these purposes, it may be said in answer that the Bureau neither needs nor desires any authority, except that based upon an enlightened public opinion. The Bureau will endeavor to aid in carrying out these purposes by conducting investigations and inquiries into the best mining and treatment practices to be found in different mining countries, and into the fundamental chemical and physical problems that serve as a basis for more efficient metallurgical operations. It will thus endeavor to indicate how all branches of the industry may become both safer and less wasteful; but the Bureau will leave to other agencies the enforcement of new requirements, or even the adoption of its recommendations. It will, to quote the language of the statute creating the Bureau, "make diligent investigation of the methods of mining, especially in relation to the safety of miners, and the appliances best adapted to prevent accidents, the possible improvement of conditions under which mining operations are carried on, the treatment of ores and other mineral substances, the use of explosives and electricity, the prevention of accidents, and other inquiries and technologic investigations pertinent to said industries, and from time to time make such public reports of the work, investigations, and information as the Secretary of said Department may direct, with the recommendations of such Bureau." It will publish the results of these investigations and inquiries in such form as to make them easily interpreted in daily mining practice in the United States.

The new Bureau will do everything it can do to encourage each State in the investigation of its own

*Address by J. A. Holmes, Director of the Bureau, at the session of the American Mining Congress, Los Angeles, California, September 28, 1910.

local mining problems, and in the proper inspection and supervision of the mines operating within its borders. It will do everything possible to help maintain and increase the influence and effectiveness of the State Mine Inspector. It will endeavor to cooperate with, but not to belittle or supplant, the work of the State. Similarly, it will do everything within its power to encourage private mining corporations to investigate their own local problems, and to properly inspect their own mining operations, with the view of lessening the loss of life and waste of resources. It will itself take up inquiries and investigations in which the National Government as such is a party at interest, and to those other problems in relation to the mining and treatment of our mineral resources that are general in their application, or national in their importance. The Bureau will in this way endeavor to minimize the responsibility of the Federal Government; and to minimize the contribution which the Federal Treasury may be called upon to make in behalf of a proper development of the mining industries. In the wise development of our two great foundation industries, agriculture, and mining, which are alike essential to the present and future welfare of the Nation, the Federal Government, the State, and the private individual or corporation each has its responsibility and its duty, which responsibility and duty no one of them should shirk. The welfare of each is essential, and each should co-operate with the other for the accomplishment of the important purpose in view—the safest and most efficient use of our resources, considered in its relations to both the individual and the Nation, both the present and the future.

The work of the new Bureau should not diminish the work of the private mining engineer, but, on the other hand, should increase his work by pointing out to mine owners additional problems which he should be called upon to solve at the cost of the parties most interested. Such has been the result of the preliminary work conducted by the Technologic Branch of the Geological Survey during the past few years, and a similar result should follow the work of the Bureau of Mines. In all these relations the aim of the new Bureau will be that of helpful co-operation, and not of interference or suppression.

Every one responsible for the establishment of the Bureau of Mines realizes the fact that its first duty is to aid in lessening the loss of life in mining. Those associated with the work of the Bureau realize that the mine owners of this country are in full sympathy with this purpose, and that they stand ready to put into practice, as far as conditions will permit, every practicable recommendation and suggestion that the Bureau may have to make. On the other hand, the people of this country are beginning to realize that many of the methods practised and appliances used in other countries, where profits of mining, and especially of coal mining, are far greater than in the United States, can not easily be introduced into the United States, because their cost would exceed the profits of the industry here; as no industry can operate on a basis of financial loss. Nevertheless, progress is being made, as shown by the fact that the loss of life in the American mines has decreased more than 25% during the past two years. If the miners, mine owners, and mine inspectors of the country will more earnestly co-operate with each other in a determined effort, the result will be a still further lessening in this loss of life during the current and succeeding years. The appeal of the new Bureau is therefore to every man connected with the mining industry in this country, to the mine worker, the inspector, and the mine owner alike, that he do everything that can in reason be done to safeguard the lives of the men who labor underground; to see that the disasters at Monongah, Darr, Marianna, and Cherry shall have no counterpart during the winter of 1910; and that the daily toll in the lives of miners from other causes, less impressive, but in the aggregate more destructive than these awful disasters, shall steadily diminish. Of all the great mining countries, the United States is pointed out as the most wasteful of both life and resources. It was with a view to remedying this situation that a National Bureau of Mines was created.

In the demand for the creation of this Bureau, the mine owners and mine workers alike have joined. Let no one of these suppose for one moment that with the establishment of the Bureau his work has ended; for in reality it has only just begun. It is only under the good advice of those most familiar with all branches of mining that wise leadership by the new Bureau can be properly developed; and the Director of the Bureau will welcome such advice. It is only through the hearty determined co-operation of the mine owners and the mine workers that substantial progress toward better conditions can be made.

In the competitive branches of the mining industry, such as coal mining, the lawmaker also must contribute by helping to improve the economic conditions which now hinder wise practice and development. All these agencies must co-operate if the mining industry as a whole is to reach that higher standard of safety and efficiency which should characterize this American industry, and to which we look forward with full hope of accomplishment. There are many difficulties in the way, and the path will not in all cases be plainly marked. There will be differences of opinion, both as to what should be done, and as to the mode of procedure. But the Director of the new Bureau wishes the members of the American Mining Congress, and mining men throughout the country, to know that their suggestions and advice will be welcome always, even if it cannot always be followed. He realizes that this Bureau is not his, but yours, and his highest aim will be to render a disinterested loyal service to the mining and metallurgical industry in all its branches, in all parts of this country.

Small aquatic and insect life flourish around the borders of the Sargasso Sea. There are numberless varieties of fish, molluscs, shrimps, crabs, and waterfleas. Almost invariably this life takes on the protective color of the masses of yellow weeds in which it lives.

Presidential Address

By E. R. Buckley

*It is gratifying to be able to report a most successful year in the history of this organization. Our financial condition has improved and our membership has increased. Our legislative campaign has been a success and the committees have been especially active in conducting the investigations committed to their charge. The American Mining Congress has been accorded scant recognition in some sections of the country during the years passed, partly on account of its aggressive policies, partly on account of manifest indifference, and partly on account of the men who represented those policies. Today the attitude of indifference is passing, and we include among our members many of the foremost mine operators and mining engineers of the country, all of whom are sharing in the work which this organization is carrying on.

The work of this Congress is an association of men interested in mining, maintained for the purpose of encouraging mining in all its various phases and to promote a spirit of co-operation between the mining industry and agriculture, manufacturing and transportation, to the end that the development of these industries may be mutually helpful and that each may receive from the other and from the Federal and State governments its just proportion of encouragement through co-operation.

This Congress has no systematic means of securing funds, except through the fees and annual dues of members. These alone will about sustain the permanent headquarters, paying the salary of the secretary and the clerical force. The fund obtained in this way has never been adequate to carry on legislative campaigns and pay the expenses contingent upon the annual meeting. The campaign for the Bureau of Mines last winter required the maintenance of an office in Washington for six months, and the almost exclusive time of the secretary and a clerk. This campaign was made possible only through the efforts of the Sierra Madre Club of Los Angeles, which secured voluntary contributions from mining men of the Southwest sufficient to meet these expenses. It ought now to be possible for the organization to carry on such legislative work as may be necessary from the permanent headquarters. This will afford the secretary an opportunity to devote his time and attention chiefly to the work of strengthening the membership and securing of voluntary contributions to provide for any liabilities which may be incurred in excess of the receipts from annual dues and membership fees.

Several years ago the Mining Congress provided for the establishment of branches in the mining centres of the country. Several branches have already been organized and others are in prospect. There appears to be no reason why many of the local mining organizations should not affiliate with the Mining Congress, thereby serving the industry at large and securing for themselves the close and intimate co-operation of the national organization. Undoubtedly there are many questions of a local character which cannot be dealt with through the national organization, but that organization might render important service to the local branches in solving these very problems. The organization of local branches cannot be easily effected without having a representative of the national organization on the ground. For this reason it is thought that in conjunction with the work for members during the coming year the secretary might devote a portion of his time most profitably to the organization of branches.

At the Portland convention, after a strenuous contest, permanent headquarters were established in Denver. This action was taken with the understanding that the State of Colorado and the city of Denver should provide amply for the housing and care of such headquarters as might be required to carry on the work of the organization. The permanent headquarters of this association are a credit to any city, to any State, and I believe that any city or State that has been neglectful of its obligation should be reminded of the fact that there are other States and other cities which will not only be willing but glad to assume any measure of responsibility necessary to maintain this organization in their midst.

After 13 years of agitation for recognition by the Federal government, 10 years of which was spent in a hopeless struggle for a Department of Mines, with its head a member of the President's cabinet, there has been created a Bureau of Mines, for the maintenance of which $502,200 has been appropriated. I can only believe that it was through some misunderstanding on the part of our representatives in Congress that the appropriation for the investigation of our structural materials was made to the Bureau of Standards rather than to the Bureau of Mines. These investigations clearly belong to the Bureau of Mines, and there should be little difficulty in having Congress direct any subsequent appropriations into the proper channels. The Bureau of Mines has been created on broad principles which will admit of carrying on any technological investigations which may be construed as being pertinent to the mining industry. In importance it stands equal to the long established Geological Survey, which has rendered much important service to the mining industry in the field of exploration.

The mining industry is now represented by two Federal Bureaus, of equal importance; one of which is concerned with those activities which are exploratory in nature, and the other of which is concerned with such activities as may be termed operative, or technological. Because this association has been active in the creation of the Bureau of Mines is no reason that it should forget its obligations to or withhold its support from the Geological Survey. Neither should we in any way permit the personnel of the Bureaus to influence our activities in behalf of either. From diligent inquiry I find that there are many fundamental problems connected with the

*Abstract of address by E. R. Buckley, president of the American Mining Congress, delivered September 26.

treatment of ores in the Western mining camps awaiting such investigations as appear pertinent to the Bureau of Mines. In my own State, for example, I am confident that of all the zinc mined, not to exceed thirty per cent has ever reached the consumer. I commend to you for your consideration the desirability of urging upon Congress the making of appropriations to the Bureau of Mines for carrying on investigations in the metal mining districts, where losses of this nature are evident.

I have yet to hear any well founded argument against the establishment of experimental stations by the Federal government to assist in solving the more difficult problems of ore concentration.

In connection with a revision of our mineral land laws there appears to be much difference of opinion as to what is most desirable. It is evident that there is at present too much litigation in perfecting and retaining titles to mineral lands and this appears to be attributable to the nature of our Federal and State laws. There is dissatisfaction in the classification of the lands of the public domain, especially as pertains to the rulings of the Forestry Service. In some of the larger mining camps, much land is tied up through ownership by extinct corporations, through questionable tax titles, through ownership by widely scattered co-tenants, and in estates which have not been administered upon. In the case of Leadville, for example, the ores are widely distributed. There are perhaps 5000 mining claims in this camp and yet only a small portion of these are being developed, and in a great many cases it would probably be impossible to find all of the owners and when found it would not be uncommon to learn that they would be unwilling to co-operate with each other to mine or prospect the property. In a great many cases the owners await development of the property, until adjacent properties have disclosed something of value believing it to be to their ultimate interest to do so. As a result more than one-half of the desirable mining property in this district is idle, and no one can develop it. I call your attention to the report of the committee on the Revision of Mineral Land Laws. It is evident that this organization should seriously consider the recommendation of a general revision.

There is also the question of establishing assay laboratories under the Bureau of Mines for the making of free assays in the case of undeveloped properties. This as well as the proposition for the establishment of experimental stations has been objected to by mining engineers and professional assayers on the ground that it would be an infringement upon the work of a well established profession.

The mining industry has suffered for years from the pseudo-professional man who lends himself to the support of fake mining propositions. The public at large has little acquaintance with the standing of the various individuals who make reports upon mining properties. There should be some way of publicly branding these fakers. How best to bring about a change in this condition is a matter worthy of your consideration. As a result of the activities of this organization, several of the States have enacted laws to punish the man who handles mining stocks with the purpose of defrauding the public. While it might be possible to estimate the amount of money going into mining propositions it is not easy to determine how much is going into actual mining. Overcapitalization of many otherwise meritorious mining propositions has long been practised, and I believe that another method of restoring confidence in the mining business would be to urge upon the several States the enactment of laws which would prevent this imposition from being practised upon the investing public.

Under our present system of judicial procedure the burden of proving negligence, upon which the recovery of damages in the case of accident, depends, rests upon the plaintiff. The difficulties surrounding the producing of this evidence and the consequent practical impossibility of securing reasonable and just compensation for injury through the strictest employers' liabilities laws, is evident to any one who has come in contact with such proceedings. This question has been under consideration for a year. Let us, as a representative body of mining men, not only endeavor to secure such legislation as may lessen the dangers attendant upon mining but also to give our influence to the perfecting of plans whereby the laborer and his family may be adequately compensated, in case of injury or death.

While we are giving attention to safety in mining we should not forget the question of health. The breathing of dust from drilling machines and from illuminants and also from deteriorated air is harmful to those who spend their nights or days beneath the surface. It is possible that something might be done to better the conditions in the way of sanitation and ventilation.

Uniformity of State laws governing mine inspection will be the subject of a report by one of the standing committees. The laws regulating mining are as many and as varied as there are mining States. Many of the provisions of these laws might be made uniform throughout the country, in spite of varying local conditions.

This organization should express its continued interest in mining education. The public, let alone those engaged in the business of mining, know too little about even the elements of mining. The establishment and maintenance of mining schools in many of our States has been a struggle against the widespread demand for agricultural and general engineering education, which of late years has swept the country. We maintain that mining is as important to the industrial development of the country as agriculture, and there is no reason why our Government should not provide as liberally for the one as for the other.

One who has given attention to the price of mining stocks as quoted on the various exchanges of the country cannot help but be struck with their constant fluctuation, regardless of the actual changes in the condition of the properties. The price of mining stocks does not depend altogether upon the earning power of the property. The fluctuations are the

result of buying and selling, chiefly on margins, which is gambling. The business conditions of the country would be vastly improved were it possible to eliminate this speculative element from our industrial activities. There is now a movement on foot, led by the Mining and Metallurgical Society of America, to provide the New York Curb Exchange with authentic reports concerning the actual condition of mining properties listed on the Exchange.

The reports of many of the mining companies are very meagre as to earnings and reserves, on account of which stockholders are not acquainted with the condition of the properties in which they have invested.

During the past few years much has been said and written upon the subject of conservation of our natural resources. It is an old subject, almost as old as civilization. It is a question of extravagance; a question of wasteful and luxurious living. We have been and are today living in a land of plenty, and perhaps too little thought has been given to the careful exploitation of our natural resources. The great corporations of the country are being looked upon by the public as the destructive agents of the present generation. Strange as it may seem to some, in the mining industry, at least, they are the least wasteful of the natural resources, which they are engaged in exploiting. There appears to have been some confusion of the question of conservation with that of ownership of the public domain. They undoubtedly have some relation to each other, but in their fundamental natures they are distinct problems. Dr. T. C. Chamberlin, of the University of Chicago, has recently made the point, and rightly I believe, that "Conservation of our natural resources centres in the scientific and technical" while "the right of ownership and the most desirable distribution of ownership centre in the political and sociological." This means that whenever it shall have been determined whether the lands of the public domain shall be owned or leased by the individual, company, or corporation, we will still be confronted with the question of conservation. As far as the conservation of our mineral resources is concerned, it must be conceded that such ownership or distribution of ownership as will result in the least waste, is theoretically the most desirable. This organization is vitally interested in conservation, as well as in the question of the disposition of the public domain, in so far as it affects the mining industry. I do not wish it to be understood that this body has less to do with the one than with the other, but this I do wish to emphasize, that in dealing with these questions, by resolution or otherwise, consider them apart from each other as far as possible.

Four things appear to be perfectly clear in a consideration of the conservation problem: First, as mining men we cannot afford to have the government enact legislation which will make the occupation of mining more hazardous; second, that nothing shall be done that will retard the development of manufacturing industries that depend upon the products of the mines for their business; third, that everything possible be done to increase the percentage of metals that can be recovered from ore and from deposits of coal, oil, and gas; fourth, to bring about as quickly as possible the use of substitutes for the present sources of power and for the metals which are supposed to be limited in quantity. The waste in coal mining is said to approximate 50%. This waste, however, cannot be decreased beyond a point where mining becomes profitable. Under the present conditions of the industry there appear to be five ways in which this waste may be lessened, namely, by improved methods of mining, by decreasing the profits, by increasing the price of coal to the consumer, by reducing the price of labor, and by securing markets for the poorer grades of coal. In the direction of improved methods of mining and marketing the poorer grades of coal, the Bureau of Mines should be of assistance. In some of the other directions there may be an opportunity to decrease waste, but these are matters which require investigation.

In searching for ways and means of eliminating waste in mining; in the investigation of ways and means of securing greater efficiency, more heat and power, from the mineral fuels; in the investigation of new sources of heat and energy; and in making available other known sources there is a vast and important field for governmental activity. It has been estimated that the water power of our streams is capable of producing about 30,000,000 hp.; more than is necessary to turn every wheel of industry in the country. Some of this power is not at present available and probably will not be for generations to come.

The man who is engaged in mining is also interested in conservation as it affects our forestry policy. I think that every one is interested in the conservation of our forests, that is, the protection of our timber supply against the waste and destruction which has marked the advent of the lumberman in his march across the continent. On the other hand the rulings of the Forestry Bureau have, in some instances, caused unnecessary hardships to the men engaged in mining who have sought to secure timber for their legitimate operations. This may not be due so much to the rulings of the Forestry Bureau as to the placing in the hands of incompetent and irresponsible forest rangers the authority to interpret and enforce these regulations. There will be no diminution in the amount of timber cut and manufactured into lumber until the public is supplied with materials for building which will be equally satisfactory and as cheap as lumber, or until the demand for structural materials shall lessen. No one anticipates a time when the demand for building materials will lessen, for that means business stagnation and industrial decadence. However, we all look forward to the time when brick, tile, terracotta, and concrete can be used in building constructions at a cost which will not exceed that now paid for lumber.

Among our metal resources iron and steel, from an industrial standpoint, may be considered the most important. The rapidity with which known iron reserves are being exploited may justify the apprehension that within a century or two this material will be insufficient to supply the demands of industry.

There are, however, vast quantities of low-grade iron ore which have been ignored in most estimates of iron ore reserves. It is believed that these ores will become available through improved processes of concentration or smelting by the time the richer deposits fail to supply the demands of the iron and steel industry. We know that aluminum, which is now produced in limited quantities, can be used in many places as a substitute for steel and iron. There are unlimited quantities of aluminum combined with silica in the form which we know as clay. In quantity it is as nearly inexhaustible as any material we have. I feel confident that some day we will know how to separate, commercially, the aluminum from the silica, thereby providing a metal substitute for iron and steel. In the present stage of our industrial development copper is an extremely important factor. There is every evidence that this material occurs in sufficient abundance to meet all of our industrial demands for many decades to come. The demand for this material will decrease with the development of the wireless telegraph, the wireless telephone, and the storage battery cars. With the development of these new methods of transmission I anticipate that the time will come when the demand for copper will decrease rather than increase. Whether a time will come when substitutes will be found for lead and zinc it is not so easy to predict. These metals are used for a multitude of purposes, many of which could be eliminated without seriously affecting our industrial progress. Although I am opposed to any policy which removes from the public the possibility for developing any of our mineral or allied resources, I would not have you think that I am opposed to conservation or that I wish in any degree to retard the movement against the extravagance of our people. I deplore the fact that we place so small a value upon the lives of our citizens working in our mines; I deplore the waste of our mineral resources; and I believe that the Federal and State governments should do everything in their power to protect the lives of their citizens and compel individuals and corporations while using our resources not to abuse them.

I am not opposed to the organization of our industrial activities through the formation of well capitalized corporations. Any criticism that might be offered would be directed against the methods by which the business of some of them is conducted and the utter lack of respect which some of them have for the less powerful competitive organizations and for the public at large.

I believe that our governmental activities should be directed to the control and regulation of our great industrial organizations, while at the same time generous support should be given by the Federal and State governments to technical and scientific investigations. Through the proper encouragement of research I believe that the ingenuity of our people will meet the conservation problem and that the expansion of commerce and manufacturing will go on, unless luxurious living, too often the accompaniment of great wealth, destroys this nation, as it has the great civilizations of the past.

The question of the ownership of the public domain should be considered apart from that of conservation. In doing this it should be remembered that ownership, which may be otherwise desirable, may be undesirable from the standpoint of conservation and vice versa. In all discussions which may come before you bearing on this question, keep clearly before you the fact that the question of ownership is political and sociological while conservation is technical and scientific.

It is not my purpose to discuss this problem, but when you consider it in the sessions of this Congress or in committee, remember that one of the greatest incentives to exploration, to prospecting, in this country has been the right of possession after discovery. Remember that the possession of water-power rights are often an important adjunct to the successful development of mining properties; and that without timber, however important it may be as a means of conserving the rainfall of a region, it would be impossible to operate many of our most important mines. It appears that any proposed legislation bearing upon the disposition of the mineral lands, lands containing water-power sites, or forested lands, which might discourage prospecting or make mining more hazardous should be carefully considered before being approved by this body.

The American Mining Congress has accomplished something in the years passed; what it may do in the future lies in your hands. You are here to outline a policy for the coming year. Remember, that it requires time and money to accomplish those things which you may outline and when you vote to have this Congress use its best efforts to secure some legislation and do not provide the means to carry on this work you are expecting an income without an investment.

In case you ask this Congress to do anything which requires expenditure of time and money, you will do well to accompany that request with some feasible plan whereby the necessary finances may be provided. It is an easy matter to provide a finance committee, but it is not easy for such committees to secure the funds required to defray the expenses of the association's activities. It may do some good to pass resolutions memorializing Congress to pass such and such bills, but if you earnestly desire the passage of any measure such resolutions must be followed by an active campaign, which requires both time and money.

This association was organized to teach mining men the value of co-operation; that success cannot be measured by another man's failure; that we must have a decent respect for the lives and health of the men that toil beneath the surface; that there must be a willingness to provide adequately for the men and their families who suffer through accident or death; that there should be laws to restrain and punish the man who is in part responsible for the disrespect in which this profession is held, the fake promoter, who parasites on the public; that all the Bureaus of the Federal and State governments, engaged in investigations associated with mining, are helpful and deserve our undivided support.

Conservation as it Affects Coal Lands

By E. W. Parker

*In the popular mind the cause of conservation had its beginning in the calling of the first conservation congress in 1907—and that was the time of popular awakening, but as has been recently pointed out by C. W. Hayes in an address delivered at Chicago, for a quarter of a century or more before the calling of that famous convention, thinking men had been studying the problem and had recognized the necessity for an abatement in the wasteful methods of utilizing our natural resources. Mr. Hayes calls attention to the great work of Major Powell, the second Director of the U. S. Geological Survey, and how the possibilities of irrigating, and thus reclaiming, or conserving, the use of the arid lands clearly and forcibly pointed out by Major Powell as early as 1878, found their realization 24 years later in the enactment of the Reclamation law of 1902.

Actual practical work in the conservation of our coal supplies was being carried on when many of those present were studying their grammars and geographies and knew little and cared less about the waste of natural resources. To the close of 1908 we had produced and consumed in the United States over 7,280,000,000 tons of coal, and that this represented (allowing half a ton of coal lost for each ton mined), an exhaustion of nearly 12,000,000,000 tons. When we consider that this has used up only four-tenths of one per cent of the original supply it does not appear that the United States will be suffering for fuel for some time to come. But it must be remembered that by far the larger part of the coal remaining is either low grade or accessible only with difficulty, and at greatly increased cost. We are taking the best and the most easily mined and we have been using it in a wasteful manner. We may look at the present increasing rate of production for the exhaustion of our high-grade and easily mined coal before the middle of the next century. Conservation of coal began in the anthracite region of Pennsylvania, where within a small area of less than 500 square miles is the most valuable supply of coal known in the world. The early method of anthracite mining, marketing, and utilization of anthracite was in the light of present knowledge, horrible examples of profligacy and waste, but probably as well as could be done under the conditions that existed at the time. Competition instead of being the life of the trade came near to being its murderer. Yet man was not nearly so wasteful as nature had been, for while nature had been generous in the first place she was more wasteful than her children, for it has been estimated that of the total supply of anthracite originally deposited only 6% remained when man began to utilize it. Back as far as 1883 or 1884 nearly twenty-five years before the calling of the first conservation congress, the necessity for the conserving of the remaining part of that six per cent of anthracite was borne in upon some of the thinking men engaged in the industry. When the movement, headed by Eckley B. Coxe, P. W. Sheafer, William Griffith, and a few others, began, it is doubtful if the recovery of coal was as much as 40%, 60% being lost, partly in the pillars left to protect the workings, partly in the small coal thrown on the culm banks and for which there was no market. The matter being brought to the attention of the Governor of the State he appointed the Anthracite Coal Waste Commission. The Commission made its report in 1887. It was the first conservation report, and as a result the waste in the anthracite region has been so diminished that now it is estimated that the recovery exceeds 60%. Moreover, in addition to the larger recovery at present, provision is made for subsequent recovery of a large part of the coal now left as pillars. This is practical conservation. In order to accomplish it, it has been necessary to put the industry under a close control and to eliminate competition except in so far as bituminous coal competes with anthracite—to create practically a monopoly of the anthracite supply, but I do not believe that this has resulted in any oppression of the people by extortionate prices. The average price of anthracite at the mine ranges from $2.25 to $2.35 per long ton and of this 40% of the output is of pea size and smaller which is sold below the cost of production.

The competitive conditions that formerly existed in the anthracite region still obtain throughout the bituminous producing States. Mine competes against mine, district against district, and State against State. Illinois is jealous of West Virginia; Iowa, Arkansas, and Oklahoma complain of unfair competition from Illinois coals. The New River, Kanawha, and Pocahontas districts of West Virginia are rivals for the same markets, and almost a trade war exists between the southwestern districts of Illinois and those of the southern and northern parts of the State. The effect is unwholesome. It is against the conservation of the coal, and worse than that, it is against the conservation of the lives and limbs of the miners. There is not sufficient margin between the cost and selling price of bituminous coal to enable the operators to mine the coal to the best advantage, nor to provide the proper appliances and superintendence to secure the maximum safety to the employees. This competition between States makes it impossible to secure the proper legislation looking to greater safety in the operation of coal mines, for the law-making body of one State is not apt to enact legislation which will place one of its important industries at a disadvantage with that in a competing State. Still less are the legislators inclined to enact laws that will restrict the miner in the exercise of what he considers his personal liberty.

I am convinced that the most crying need in the coal mining industry is the ability to enforce discipline among the mine workers. As it is now there is not, so far as I know, in any State, laws which make it a penal offense for a mine employee to put his own life and that of his fellow workers in jeop-

*Read before American Mining Congress, Los Angeles, September 26.

ardy. The only punishment meted out is the death or injury that results from the catastrophe. Coal mines of this country should be under as strict police surveillance, as they are in Europe, and both operators and miners should be made to obey the laws. One of the most reprehensible practices in the mining of bituminous coal is that of 'shooting from the solid' a practice that has increased through the custom forced upon the operators in some States—of paying for the coal on a mine-run basis. It results in 'making the powder do the work' of the miner and this adds materially to the liability to explosions from the quantity of dust produced and to the frequency of 'windy shots.' Moreover, the excessive charges of powder necessary weaken the roof and pillars. It is abominably bad and yet the State of Oklahoma has by act of legislature, put a premium on this kind of mining.

The shooting of coal from the solid and paying for the mining on a mine-run basis, except in cases where the slack coal may be used to advantage in the manufacture of coke, is anti-conservational in the production of a disproportionate quantity of either unsalable or undesirable coal.

When in the effort to conserve our resources, the expense exceeds the benefit to be derived, the cause has got to suffer. Much has been said about wasteful methods of making coke in bee-hive ovens and the fact is that the value of the gaseous content of the coal wasted each year exceeds $50,000,000. It has been a question whether it would not cost more than that amount to save it. Until recently the tar produced in the manufacture of illuminating gas has been a drug on the market and much of it has been thrown away or burned for fuel at the works. With the increasing scarcity and higher cost of railroad ties, however, there has been a notable increase in the demand for creosote oils, a product of the coal tar, for preserving ties, and the development of the coal briquetting industry in different parts of the country is creating a demand for the residual pitch. This is giving an impetus to the retort coke-oven industry, and in the course of time the bee-hive oven will disappear from the United States as it has disappeared in European countries. The change will be gradual as there is a large capital invested in bee-hive oven plants, but while the first by-product recovery plant of 12 ovens was put in blast in 1893, retort oven coke in 1908 was 14% of the total output. In our neighboring Republic of Mexico, retort oven plants have been erected in the State of Coahuila. The gases are utilized in the power plant, each oven yielding the equivalent of 16 hp. of fuel. A better grade of coke is obtained and at the same time a higher yield in coke. The ovens in the Connellsville and lower Connellsville districts of Pennsylvania would at the rate they get in Mexico, produce approximately 600,000 hp. every day in the year.

In coal mining as in other lines of industry the most effective conservation and economy can only be secured through the conducting of operations on a large scale. It is the large and not the small unit that is able to effect the greatest saving. The small coal mine is always the most wasteful.

It is only through such extensive operations as those of the United States Steel Corporation that the greatest efficiency and the maximum economy can be secured. The Steel Corporation, by the way, has erected in Indiana and Illinois, 280 retort ovens and contemplates increasing the number to 1000. The Cambria Steel Co., at Johnstown, Pa., which was one of the pioneers in retort-oven construction in this country, having built 60 in 1895, has now nearly 400 of them in operation, and I am of the opinion that most of the coke made by this company is made in by-product ovens.

The development of the coal resources of Alaska has been the subject of much discussion during recent months. Mr. Brooks has, in his latest progress report, shown how the Territory is suffering for the need of coal while its coal lies undeveloped for want of legislation to permit it. It cannot be accomplished when the unit of operation is limited to 160 acres. It will require the investment of a large amount of capital and it must be recognized that the mining operations and the transportation interests shall not be antagonistic, for the one must depend upon the other. Millions of dollars will be needed and in order to secure them the terms must be liberal, but there is no reason why the interests of the people might not be secured against monopolistic oppression. Is it wise conservation to allow these fields to lie undeveloped while West Virginia and Pennsylvania coals are brought to the Pacific Coast at a cost of half a ton of coal consumed in the transportation of each ton of coal carried?

Attempts to concentrate copper carbonates and oxides by wet methods have been unsatisfactory, for the reason that the valuable mineral slimes to such an extent that mechanical concentration seems to be a physical impossibility. Tin oxide (cassiterite) has a high specific gravity and when crushed is granular with no pronounced tendency to slime. Therefore it offers no unusual difficulty in concentration. Cinnabar is a sulphide of mercury, and although it is soft, concentrates far more readily than most soft minerals, by reason of its high gravity. It can be saved on any good concentrating machine. The Colorado 'bumping-table' has been known to do excellent work in concentrating ores containing cinnabar. In some instances dry concentrating machines have done better work in effecting a concentration of oxidized copper ores than could be done on the ordinary machines.

The copper shells of blasting caps weigh about 0.05 lb. each. That is, it requires from 450 to 500 shells to weigh one pound avoirdupois. In gold mines practically all of the caps employed in blasting in ore go to the mill with the ore and into the battery or grinding mills. Where amalgamation is practised these copper fragments are amalgamated with the gold, and eventually the greater part of it goes into the bullion bars. In a mine where 1000 shots are fired monthly in the stopes about 2 lb. of copper is present in the caps, and this mostly goes into the bullion, thus reducing its fineness.

Mine Accidents and the Bureau of Mines

By George S. Rice

*While it is evident that there is a great diversity of opinion among American mining men as to the proper functions of the new Federal Bureau of Mines on one point at least there appears to be general agreement namely that the investigation of accidents in coal mines started under the jurisdiction of the Geological Survey should be continued, and that a similar investigation should be made of accidents in metal mines.

A prominent English mining engineer, while speaking of accidents in metal mines, remarked that coal miners were fortunate in having disasters occur in their mines. This, at first, seems like a brutal statement, but when the matter is considered carefully, the meaning becomes clear, since in spite of the large number of men who have been killed and injured in the great colliery disasters that too frequently have appalled the world, the number of deaths and injuries from this cause have formed only a small part of the total number killed and injured in coal mining by other causes, particularly those due to falls of coal and rock.

In 1907, the year of the greatest series of American colliery disasters, E. W. Parker reports 947 men killed and 347 injured in gas and dust explosions. During the same year in all the coal mines of this country, there were 1122 killed and 2141 injured from falls of roof or coal, and from all causes, the totals for that year were 3125 killed and 5316 injured. Therefore, of the total number killed and injured, less than one-third were killed and one-fifteenth were injured by explosions, in that year of greatest mine explosions.

In more normal years, like 1908, during which 2450 were killed and 6772 injured, only one-sixth of the killed were lost in disasters and one-twentieth of the total were injured by explosions of gas and dust.

Nevertheless, as previously indicated, the horror produced by the explosions has caused attention to be directed to accidents in coal mines, and the precautions taken on this account have led to a general improvement in colliery conditions; and in all civilized mining countries, except the United States, the accident rate has been steadily decreasing.

In the United States the annual accident rate of coal mining nearly doubled in the ten years from 1897 to 1907, when we attained the high annual death rate of 4.86 deaths per 1000 employees. Fortunately, the year 1908 showed a reduction to 3.60 deaths per 1000, and in 1909, the death rate was still further decreased. We can only hope it will continue to decrease. The present rate is most appalling when one considers it, particularly in comparison with that of France or Belgium, where the annual mortality rates are but 1 per 1000.

In view of the high accident rate in the collieries of this country, it might be questioned if the attention attracted by the disasters has led to much improvement of conditions. Undoubtedly there has been improvement, but it has not until 1908 kept pace with increased dangers due to rapid development and greater natural dangers arising from greater depth of workings with consequent increase in flow of explosive gas and the increased use of black powder in lieu of pick work.

Metal Mining Accidents.— When attention is directed to metalliferous mining accidents, it is surprising to find that many of the States in which mining is done make no record of the deaths and injuries in metal mining, and the Federal government has hitherto made no attempt to gather such statistics.

This strange lack of information cannot be because the metal mine operators as a rule are less interested in the welfare of their employees; there are many instances to show the contrary.

It is noticeable that the States that do not gather mine accident statistics are chiefly those in which there is no coal mining. Coal miners and operators, in going from the old established coal mining centres of the East and from Europe have carried with them their customs and systems of law and regulations which include the recording of mine accidents.

Metalliferous miners in this country have largely formed their own precedents, and, probably due to the wide diversity of mining systems, there has not been the same community of interests among miners until more recently. Your committee on uniform mining laws and prevention of mine accidents, in its report to this Congress, has clearly brought to attention the lack of metal mining statistics, except in certain States and those States have the best mining laws.

Frederick L. Hoffman, the well known statistician, has done valuable service to the metal mining industry in attempting to obtain, in spite of lack of official statistics, the fatality rates in different parts of the country. I will not attempt to comment on his report, except to call attention to the fact that he finds the average rate is practically the same in metal as in coal mining, despite the general acceptance that the natural conditions are less hazardous. His figures also show that there is a greater variation in different metal mining districts than in different coal mining districts, and that the accident rates in both are appallingly high as compared with those of European countries.

Attacking another phase of the conditions under which miners work, Mr. Hoffman in an article in *The Engineering and Mining Journal*, July 2, 1910, has commented upon the excess of sickness and ill health of miners as a class, compared with those who work in the open air.

Haldane and Thomas Paper on Miners' Diseases.— J. S. Haldane and R. A. Thomas, in an article which appeared in the Transactions of the Institution of Mining and Metallurgy, volume 13, reached the conclusions after a study of the health statistics of miners and others living in England, Wales, and Cornwall; that apart from lung diseases and a slight excess of fatal accidents (many of which are not un-

*Paper read before the American Mining Congress.

derground), metalliferous mining in England is a healthful occupation.

Haldane and Thomas found that the mines that they examined in Cornwall were freer from gaseous impurities than the air of coal or iron-stone mines. They discussed three possible causes: (1) The stone dust produced. (2) The smoke produced by explosives. (3) Infectious bacteria.

They decided that infection by tubercular bacillus will not explain the facts relating to miners' phthisis. They considered that the smoke from explosives and candles was probably inappreciable. Their final conclusion was that the inhalation of coal dust was the cause of the lung disease which is common among the Cornish and other miners. They state that out of 142 men who had worked rock drills in the Cornwall district, 94% died of lung diseases and the average age at death was 37 years, and of 178 men who did not work with rock drills, 65% died of lung diseases, but the average age at death was 50 years. They, therefore, considered that the introduction of rock drills in Cornwall is responsible for the recent great increase in the mortality of Cornish miners between the ages of 25 and 50 years. They thought that the dust produced its effects upon the lungs mechanically, by its hardness, sharpness, and insolubility. In a discussion which followed the Haldane and Thomas paper, Dr. Oliver stated that miners' phthisis belonged to a group of diseases in which the spongy texture of the lungs became converted into a hard solid tissue. R. J. Watkins, who had charge of a sampling mill, stated that when certain kinds of dust were sampled, men were knocked out often for many days, and that a sulphide ore of certain composition gave the most trouble.

Much attention has been paid in South Africa to miners' phthisis, and in 1902 prizes were offered for the three best practical suggestions and devices for obviating, minimizing, or combatting the causes leading to miners' phthisis. It was stated that while no definite information was before the Commission, it was generally assumed that the cause of the disease lay in the inhalation of fine dust produced by rock drills.

Two hundred and twenty-nine competitors responded. Most of the suggestions were regarded as impracticable methods for wetting, through jets, the dust as made by the drill, and atomizers or sprinklers for laying the dust when made, received most attention, and some of the devices were regarded by the Commission as promising.

In addition to the menace of stone dust it is evident that in some mines and in some places, where there is no positive, or little ventilation, the breathing of gases from the combustion of explosives produces an unfortunate influence upon the men, which at times has been accumulative in its effects. We know from the work which has been done by Haldane and others the poisonous effects of minute quantities of carbon monoxide which is absorbed by the blood in lieu of oxygen, and if a man is continuously exposed he rapidly succumbs. This is the case when there is over 0.3 of 1 per cent in the atmosphere. Moreover, recovery of one partly poisoned is slow. It seems probable that when a man is regularly exposed to small quantities in the air, he may become in time incapacitated.

With nearly all high or quick explosives on the market, carbon monoxide forms a large portion of the gases of combustion. From time to time we hear of men being overcome in the mines by such gases and in some instances even being killed—notably the case that occurred in the Gunnison tunnel, in Colorado, on January 16, 1910, when a shift of men while waiting for the smoke from a round of 50 holes to clear, were overcome and nine of them died, evidently due, according to the facts as reported by the engineer in charge, to monoxide poisoning.

Investigation of Mine Accidents by Bureau of Mines.—Under the terms of enactment of the Bureau of Mines, the investigation of coal mine accidents started under the jurisdiction of the U. S. Geological Survey will be continued by the Bureau of Mines. This investigation consists of testing of explosives for use in gaseous or dusty mines (those that pass being listed as 'permissible' explosives), the investigation of safety-lamps and of rescue apparatus of all kinds; the establishment of rescue stations for the education and training of miners in the use of rescue apparatus: the investigation of mine disasters by mining engineers, with a view to finding preventives; the study of the humidity of mine air in its effect upon the drying or moistening of coal dust: the collection and analysis of mine gases and study of their sources and changes of efflux from the strata; the study by electrical engineers of the different phases of mine installations with a view to lessening the dangers therefrom; and the collection by the mining engineers of samples of coal throughout the country, which while partly for governmental fuel supplies, is also of service in connection with mine accident work, through the relation of the coal to the production of dust and gas.

The foregoing work has in the past been carried on by a well equipped laboratory at Pittsburg, aided by a small field force of mining engineers. Much time has been occupied in purely educational work among the miners and foremen. It is proposed to continue all this work and possibly to enlarge it slightly from time to time as funds may be provided by Congress, to better cover the widespread coalfields of the country.

Under the law establishing the Bureau of Mines, the scope of the work has been enlarged, and the investigation of mine accidents has been extended to cover both quarries and metalliferous mines. It is expected that mining engineers who have been already connected with mine accident investigations, will extend their observations as far as possible to quarries and metalliferous mines. The appropriation for this year will allow but few additions to the force, but if the results justify, it is not improbable that Congress will provide for extension of the work in the future.

It is manifest that there is ample room to do good work in the investigation of the metalliferous mine

accidents particularly in studying in the field the effects of stone dust and of gases arising from the discharge of explosives, and at the Pittsburg station in the study of the explosives used in metal mining, with a view to obtaining such explosives that the products of combustion will be less harmful to the health of the miners.

In another direction in quarries and in metalliferous mines the gathering of statistics of accidents by a Federal bureau working in conjunction with State bureaus, a work hitherto ably done by E. W. Parker for coal mine accidents, will be of great value, inasmuch as it will lead to precautions being taken to prevent many accidents, the causes of which are often overlooked. Unification of the methods of gathering such mine accident statistics will also be of value inasmuch as it will enable the intelligent comparison of similar kinds of accidents in different districts and countries and thus lead to betterment of conditions. Besides this valuable feature there is another. It is the tendency of the times to look forward to a time when each industry will bear the load of caring for its killed and injured. Already a number of progressive mining companies have started insurance organizations, the cost of which is borne partly by the employees and partly by the companies. In any case, there can be little question that if an industry is in a thoroughly healthy condition, it should be able to bear the cost of caring for those injured in its business, and for the pensioning of needy widows and orphans. As a matter of common humanity, this proposition can hardly be disputed. If conditions prevail otherwise, it means that the price obtained for the product should be raised to meet this condition. No doubt this movement must be gradual to not disarrange business conditions.

There are forms giving suggested classifications of accidents in metal mines and coal mines. These classifications are not in any sense final, but are put forward for discussion. They follow to some extent the English system, though a little more elaborate. It is only by close sub-division that analysis of the causes of accidents can be made satisfactorily. In another matter the Bureau of Mines may be able to give valuable aid; namely, in promoting the unification of mining laws and regulations, such as those proposed by the several committees reporting to this Congress.

There are doubtless many problems in connection with mine accidents which are not mentioned in this paper, and of which members of the Bureau of Mines staff will be glad to learn from the mining engineers of the country. While the question is complex it is worthy of our best efforts since it deals with the lessening of loss of life and limb.

The National Bureau of Statistics of the Department of Commerce and Labor reports that the export of mineral oil from the United States for the month of July was 112,402,879 gal. worth $7,332,417. The total export of mineral oil for the first seven months of 1910 was 799,565,564 gal. valued at $51,560,226, which was 50,587,324 gal. less than for the corresponding period of 1909 and $6,289,102 less in value.

Chico, Mexico

The Chico mining district in the State of Hidalgo promises soon to come into prominence and may eventually be a rival to Pachuca. It is only six miles north of that city and is reached by an excellent wagon road. The Sierra of Atotonilco or 'Mountains of Pachuca' form the great barrier range of the northern end of the Valley of Mexico, and consist of a mass of intrusive rocks which have broken through, and largely cover, the earlier Cretaceous sediments. The general direction of the range is northwest; the greatest length is 28 miles, and the width varies from 10 to 14. The highest points reach an elevation of over 11,300 ft., one of the most notable peaks being Las Ventanas, a great mass of serrated rocks, reaching a height of 10,830 ft. This peak forms a land-mark about half way between Pachuca and Chico. The southern slopes of the mountains merge gradually into the plains of the Valley of Mexico; but the northern are more abrupt and broken, dropping rapidly to the lower levels of the Grand Cañon, the drainage plain of which is several thousand feet lower than the Valley of Mexico.

Pachuca, which is on the southern slope, has a comparatively dry and arid climate and there is little vegetation in the neighborhood. Chico, on the northern slope, has a rainfall about 70% in excess of that of Pachuca, and the country is fertile and well wooded. The deep gorges resulting from the extensive erosion on the northern slope have in some cases exposed the Cretaceous slates and other sedimentaries. Some of the veins at Chico are along contacts between slates and andesites. The average gold content of the veins of the Chico district is about twice that of the Pachuca veins. The veins are also generally much wider; with these exceptions, the geological features of the two camps are similar. The massif of the range is formed of close grained andesites and porphyries. Spurs to the south consist of breccias and highly altered tuffs, the remains of earlier eruptive activity. There are extensive remains of more recent rhyolitic and basalt flows which form sharp escarpments where cut through by erosion.

The Chico vein system is the result of one main fracture zone which strikes approximately east. Most of the veins dip south. There are two main veins in the zone, the Arevalo to the north, and the San Pedro or Veta Principal to the south. These veins are approximately parallel. The gangue of the veins is quartz and calcite, the silicious matter predominating. Both free gold and native silver occur. Gold is also associated with iron pyrite and found as an alloy with silver. The silver occurs as argentite, proustite, stephanite, etc. There are traces of manganese. Various tests have been made showing that the ores are amenable to cyanidation. Extractions as high as 86% silver and 97 gold have been obtained.

Records in the archives of the church at Chico show that the Spaniards started mining in 1521, and

there are traditions culled from old Spanish writings of the mines being worked by the Toltecs in pre-Aztec times. It is stated that evidences of some of the old Indian workings can still be found. It is estimated that there are 28 miles of Spanish workings on the Arevalo vein. One of the early Spanish owners, on the occasion of the marriage of his daughter in El Chico church, paved the street with bars of solid silver (each worth ₱1200) from the door of his house to the church, a distance of 280 ft., so that the bridal pair should walk on solid silver from the home to the church. The Arevalo mine has the unique record of having been operated continuously for over one hundred years without a shut-down, and today the workings have reached a depth of over 350 metres, without the vein showing signs of exhaustion.

The mines have been worked without any regular system or method, and even during the last 50 years nearly all the ore has been taken out by the *buscon* system or tribute work, the lowest grade that was mined and brought to the surface having 32 oz. of silver or over per ton. The value of the gold contained was disregarded as practically none of it was saved by the methods of treatment in vogue. In the early days the ore was treated by *chacuacos* or Indian furnaces, and by the patio process. There were a number of these *haciendas* running until recently. The greater part of the high-grade ore has been purchased during recent years by ore buyers for smelters in other parts of the Republic. A large tonnage of milling ore amenable to cyanidation is known to exist in the various mines, and as soon as modern mills and cyanide plants are erected, there is no reason why Chico should not become as famous and as prosperous as Pachuca.

The principal owners of mines are as follows. The Compania Metalurgica de Atotonilco, the Amalgamated Mining & Milling Co., Sr. Julian Perez Duarte, the Fortuna Mining Co., the San Marcial y Anexas Mining Co., R. H. Lyman and associates, and various other mining companies and individuals. The first of these companies controls about 170 hectares of land, which includes the Arevalo, Aurora, Nepturano, Pluton, La Union, Nueva Digue, Jesus, San Rafael, San Cayetano, and Nepton mines, the Nepton adit, and the Plan Grande mill. With the exception of the work in the Nepton adit this company is operating on the most primitive plan. Mining is carried on by tribute, and the ore is sorted first underground by the miners and then on the surface by women. It is handled at least six times before reaching the mill or being sent to the smelter. The mill is driven by water-power, developed by an overshot water-wheel. Chilean mills are used for grinding. The old patio process is still used in combination with concentration of the tailing on English buddles. Losses amount to 20% of the silver and 85 of the gold. In spite of this the mines have given a total return of over ₱10,000,000.

The Amalgamated M. & M. Co. holdings are the largest in the district, covering 162 hectares, and including part of the Veta Principal, which at that point is 30 ft. across and averages 1200 grams silver and 9 grams gold per ton. The company has no mill. The ore is hoisted by horse-whims and sorted, the high-grade being shipped to the A. S. & R. Co. at Aguas Calientes. The net profits are about ₱20,000 a month from the high-grade ores. A large tonnage of low-grade ores is available.

The Julio Perez Duarte properties are at present being worked on a very small scale but as the Nepton adit has drained the workings, plans are being formulated to push the work.

The Fortuna is a small company formed by local merchants and employees. They started operations three years ago with a capital of only ₱5000. The money was judiciously spent in clearing out an old drift and in development, with the result that they cut one of the principal veins, and five others have taken out over ₱25,000 in high-grade ore. This has all been reinvested in development. A large body of good milling ore is available, but like other companies in the district, this is handicapped by lack of capital and milling facilities. The holdings cover 40 hectares.

The San Marcial y Anexas holdings cover 54 hectares. The property is not being worked at present, pending legal decisions and a settlement between the heirs of the late principal owners. The vein is on a contact between andesite and rhyolite and can be traced for about six kilometres. It measures from 40 to 50 ft. wide and has been famous for its high-grade shipping ore, some of the highest grade found in the district running from ₱8000 to ₱9000 per ton, having been found in this mine. During nine years that the mine was in operation, a total of over ₱2,000,000 was produced. This is the only mine in the district in which ruby silver is found.

R. H. Lyman and associates have, next to the Amalgamated, the largest holdings in the district, covering an area of 134 hectares. The veins are all on the contact, the most promising is the Veta Principal, with a width on the croppings of over 85 ft., strike east, and dip of 65° to the south. This vein is the most southerly of all the Chico systems and is parallel to the Viscania in the Pachuca district. The two veins are respectively on either side of the great mass of andesites that form the backbone of the mountains dividing the Pachuca and El Chico camps. The holdings include a number of other valuable veins, the most important of which will be drained by the Nepton adit. This important work is being pushed with considerable vigor. The adit measures 14 by 14 ft. and the average progress made is 130 ft. per month. The total length driven to date is 2170 metres, and with 40 more, it will cut the Arevalo vein at a depth of 370 metres. It will eventually cut the San Pedro vein at 450 metres. Up to the present time, 56 veins have been cut by the adit and it will undoubtedly prove one of the most important factors in draining and developing the district.

Never tamp powder in a drill-hole with an iron spoon or metal bar of any kind. If the wooden bar is too thick to reach the bottom of a deep hole, get one that is of less diameter, or have the larger one worked down to proper size.

Testing Placers in Korea

By R. Y. Haynes.

Recently I have had occasion to examine a placer deposit which differs greatly in its physical characteristics from those found in western North America. The method finally adopted of drilling this deposit was rather unique. The placer is a marine deposit formed at a time when the peninsula upon which it is situated was submerged, the ground having risen gradually until the deposit is now 30 ft. above sea level. At the outset it was decided to employ a hand-drill of the regulation type, using 4-in. nominal inside diameter gas-pipe. The drills, cutters, and pump were made in a local blacksmith shop by a native Korean smith. This method of working was found to be subject to grave objections on account of the fact that it was not possible, with the paucity of tools at our disposal, to make a sand-pump capable of removing the entire content of the drill-hole, and the greater part of the deposit consisting of sand, the pump tended to ram the material tight rather than lift it. The following scheme was eventually decided upon.

Drilling in Alluvial Ground in Korea.

The capping of soil and clay was bored through with a clay auger of 5.5 in. diam., and as soon as the wet sandy strata underneath were entered, usually at a depth of from 8 to 12 ft., the pipe was inserted and driven directly into bedrock, a distance of 18 to 23 ft. below the surface, or a total drive of about 11 ft., if we allow a one-foot core of bedrock. During the driving, which in the early stages was done by one man with a mallet, and in the tighter bottom gravel by four men with a pile-driver, the pipe was rotated continually in order to hasten its progress and facilitate its removal.

Owing to the fact that the stratum of pay gravel, from 2 to 4 ft. in thickness, was tight and nearly as compact as the decomposed schist bedrock it was rather difficult at first to know just when the pipe had penetrated the bedrock sufficiently, for with too thick a bedrock core, it is difficult to extract the pipe, and if the penetration was only a few inches there was every possibility that the core would drop out of the pipe during the process of pulling out the latter. Several holes were lost on this account, until the men became familiar with the sound when bedrock was struck.

With a foot of bedrock as a plug the time consumed in pulling the pipe from a 20 ft. hole was rarely more than one half hour, and often less than 20 minutes. The pulling was accomplished by bolting two 4-in. round timbers to the pipe in such a manner that they projected 4 ft. upon either side, thus furnishing a species of 'bull ring' and also two handles for turning the pipe during its removal. A 4-in. squared oak timber was used as a lever. The core for each hole was washed out into metal tubs and panned, the core of each stratum being panned and noted separately for the purpose of learning the position of the richest gravel.

Seventy-five holes averaging 18 ft. in depth were sunk with two drills by the above method in 26 actual working days at an average cost of 20c. per lineal foot. Of the above holes five were re-drilled, four on account of a lost core due to insufficient depth, and one due to a rock larger than the inside diameter of the pipe. A true core was always obtained and the calculated and measured content checked excellently when assuming a diameter of 4.5 in. It may be objected that the pipe used was of rather small diameter, but I am of the opinion that, in a given area, two 4-in. holes will give more reliable information than one 6-in. hole, and in ground similar to that described above can be drilled as cheaply as the holes of larger diameter. It is proposed to supplement this work by sinking shafts.

Mining Laws of Quebec and Ontario

By Theo. F. Van Wagenen

General.—The mining laws of the provinces of Ontario and Quebec are obtainable in pamphlet form from the Minister of Mines at Toronto and at Quebec, which are respectively the capitals of the two provinces. The pamphlet containing the mining laws of Ontario consists of 118 pages, and of Quebec 45. In addition, the Quebec Department of Mines issues a small pamphlet of 32 pages called a 'Miner's Guide.' In making an abstract covering the main features of these two laws I have spent twenty hours of close application upon that of Ontario, and eleven hours on that of Quebec, and am not yet sure that either are thoroughly understood. Both are complicated, and entirely beyond the comprehension of the ordinary reader; and of course, to the average prospector, the man who is really the discoverer of mineral indications or outcrops, the pamphlets might as well be non-existant. Unfortunately this is the case with all mining laws except those of the United States. They are prepared by lawyers, or by mining engineers collaborating with lawyers, and the result invariably is the production of a document so full of unnecessary detail, so hedged about with provisos, exceptions and penalties, and so burdened with conditions difficult or wholly impossible of execution by the prospector, that he immediately abandons the field—if he ever enters it—to the 'claim pegger,' who is an entirely different type of an individual and by no means as desirable. It is strange that this mistake is so constantly being repeated in mining countries all over the world, even in parts of our own land (Texas and Minnesota), where the Federal law does not apply. Miners of the mountain and coast States who have the good fortune to be able to operate under the simple national law have reason to be extremely thankful.

Ontario Mining Law.—Any male person over the age of 18, whether possessing British citizenship or not, may obtain the right of prospecting on the public lands of the Province (both surveyed and unsurveyed), and on all private lands where the Government has only parted with the surface rights thereof, by purchasing from the Minister of Mines of his deputy, or any mining recorder, a miner's license, which costs the sum of $5; but, if he wishes to prospect on private lands, he must in addition give a bond to the Minister of Mines, or deposit a cash sum with him, to secure the surface owner against any damage that may be caused by his operations. This license is good for a year, but may be renewed as often as desired by the payment of the annual fee. It is not transferable, is not good for the prospector's partner, must always be carried by the individual to whom it is issued, so that it can be displayed on demand by an inspector or recorder, or any rural police officer, and if lost or destroyed by accident may be replaced at the cost of $1, upon furnishing proper proofs of identity. With this document, the licensee may locate up to three claims, each of which must be 40 acres in area. A license may be issued to a partnership, and also to a company that has been duly incorporated, but neither may purchase more than one license per year. The right is reserved by the Minister of Mines to proclaim a field as a 'Special Mining Division' at any time, whereupon the size of the claim is cut down to 20 acres, and the total to 60 acres. All claims must conform in shape and position to the legal subdivisions where the country has been surveyed, or, in unsurveyed regions must be rectangular, with their sides pointing to the astronomical north, south, east, and west. No extralateral rights are allowed. The process of staking is simple, and consists of erecting a discovery post and four corner posts, of

Claims at Cobalt, Ontario.

blazing the line from the discovery to corner 1, and then the lines around the block.

Recording must be done within 15 days of staking, but if the ground is more than 10 miles from the recorder's office, an additional day is allowed for every extra 10 miles or fraction thereof. A sketch map and considerable descriptive detail must be furnished by the prospector, and the recording fee is $10 per claim. A memorandum of each claim recorded must be made by the recorder on the back of the license. The recorder has the right, after accepting the recording fee, to refuse to record, if, in his opinion, there is anything wrong. In such a case an appeal may be made to an official called the Commissioner of Mines, on payment of an additional fee of $10, and a few small charges connected with the preparation of the appeal papers. After recording, a period of 60 days occurs during which the location must be passed upon by an inspecting officer,

who has the power to reject it if it is erroneously staked or deserted, or if, in his opinion, no discovery of payable mineral has been made. For several other reasons it may be disallowed, but if it is passed, the licensee is given a 'Certificate of Record' upon payment of a fee of $1. This certificate is regarded as prima facie evidence of a good title for prospecting purposes.

To maintain such a location in force, the licensee must do 30 days work of 8 hours each upon his claim during the 90 days succeeding the date upon his certificate of record. During each of the first and second years thereafter he must do 60 days work, and during the third year, 90 days. All this work may be completed at one time, or in shorter periods, if desired. As the work for each period is finished, an affidavit to that effect must be executed and filed, and in each case a 'Certificate of Performance' will be issued by the recorder, upon payment of a fee of $1, if, in his opinion, the work has been properly done. If the certificate is refused, there is an appeal to the Commissioner, whose decision is final.

Within three and a half years from the date of the Certificate of Record, a patent must be applied for, or the claim is forfeited. The cost of patenting is small, the main item being the price for the land, which is $3 per acre in surveyed territory, and $2.50 in unsurveyed. The patent, when issued, does not convey the timber on the surface, nor any water, or water-power on it. Boys under 15 years of age are not allowed to perform underground work, and boys under 17 may not be employed on Sundays, nor for more than 8 hours during the 24 on any day of the week. No royalty is charged or collected on ore or metal extracted and sold from the claim, and when the patent is granted a fee simple title passes from the Government to the miner.

Quebec Mining Law.—In this Province the first step is the purchase of what is called a 'Miner's Certificate' which costs $10 and which gives the holder substantially the same prospecting rights as in Ontario for $5. The Quebec prospector may locate up to 5 claims of 40 acres each on his certificate, per year, and this certificate is renewable from year to year, as long as the prospector wishes to pay the annual $10 fee. The claim is a rectangle of 40 acres, laid out with boundaries due north and south and east and west, and no extra-lateral rights are allowed. As soon as the claim is staked the Minister of Mines at Quebec, or his nearest representative, must be formally advised by mail of the fact, and the 'Certificate' must be sent or brought in to have the memorandum of the location endorsed upon it. Within six months from the date of staking, the prospector must apply for a 'Miner's License' on his claim or claims, each one of which costs $10, plus $1 per acre per year, so that a 40-acre claim costs $50 cash per year to keep in force. No annual work is required. No patent is granted. Locations are transferable only with the consent of the Minister of Mines. The latter has also the right to substitute a royalty for the above mentioned annual fees, but this royalty cannot exceed 3% of the value of the ore at the mine, after deducting the cost of extracting it. A license must be obtained to put up any kind of ore treating plant except such as may be operated by hand power, the fee for the license being $5.

Comparisons.—In both provinces the miner is required to make out statistical returns early in January of each year to the Minister of Mines, giving the number of men employed, the class of work performed by each, the wages paid, the mineral extracted, the proportion of it sold in the crude condition, and the proportion dressed or concentrated or otherwise beneficiated. Reports to this effect may be demanded of him monthly, at the discretion of the Mining Departments. There are also long lists of 'regulations' connected with the underground operation, the use of explosives, the housing of workmen, the payment of wages, etc., all good in themselves, but generally difficult of execution in the wilderness. It is therefore easy to understand why prospectors are hard to find in Canada, and why the exploration and development of the vast region around Hudson's Bay has proceeded so slowly. It is now over twenty years since the copper-nickel deposits of Sudbury were discovered, and more than five since the silver mines of Cobalt came to light, and these represent really the only two proved mineral fields of eastern Canada. Both were discovered by accident, by laborers engaged in grading for railway companies. Of late, we have heard of more or less excitement at Larder, Porcupine, Gowganda, and a few other points to the north of Cobalt, but the bulk of the work at these places is that of claim peggers, operating in conjunction with stock and share promoters in Toronto, Montreal, and Quebec. It is doubtful if there is a prospector (as the term is understood in the United States), in the whole of eastern Canada, and it is safe to say none will go there until the laws are altered. The genuine prospector, the real discoverer of new mineral fields and mines, is invariably a poor man, quite unable to pay for the privilege of looking over a country, inexperienced in business affairs, without clerkly capacity, and utterly incapable of carrying out the provisions of such laws as those from which the above extracts have been made. He is also a rather independent person. It may be justly claimed that he is exclusively an American institution, the result of our extremely simple and liberal mining law. He wanders by the thousands during the prospecting season all over the West and in Alaska, each year making discoveries in fields that are already the most actively worked of any in the world, but he stops abruptly in his journeyings at the lines of Mexico, Texas, Kansas, Nebraska, the Dakotas, and Canada, refusing to explore in places where he has to pay for the privilege by purchasing a license, or where the regulations connected with making a location and maintaining a title are complicated, expensive, or burdensome, and impose obstacles to the quick sale of his prospect, for the prospector is an explorer and discoverer, and not a developer. He is at the foundation of the industry, and the mining law must be drawn so as to allow him his reward.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

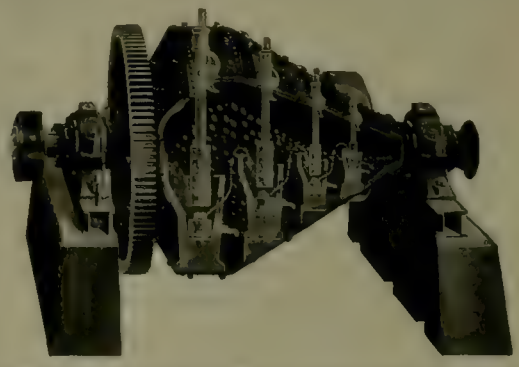
Crushing by Stages

The Editor:

Sir—As the indirect cause of a most animated discussion as to the real and supposed merits of the range and efficiency, or if you will, the inefficiency or inability of the conical pebble-mill to fill all gaps and delinquencies of all other fine-grinding machines to which the metallurgist falls heir, I have read with a parent's interest the discussion that has been going on for some weeks in your issues, between Felix Cremer and Algernon Del Mar. I would hardly be human did I not feel kindly toward Mr. Cremer in his advocacy of my 'baby.' He frankly states that the child looks healthy, pats him on the back and encourages him to win a place among the grown-ups, while Mr. Del Mar takes the position that even though his body is formed on correct lines, he does not believe that he will be able to hold his own. Then comes Stuart Todd into the discussion, in which he refers to a Hardinge conical mill as a single-coned mill. Every conical mill, so far built by my company, was and is double coned. Some time since we felt highly flattered, though we must confess a little annoyed, to find that our child was attracting the attention of the kidnaper. We now allow him to run the streets alone, for he has gained so many powerful friends that we have no longer fears for his safety.

Mr. Del Mar is right when he says that he believes the conical mill has its limitations. In this 'it is almost human,' at the same time we believe he is wrong in advocating two tube-mills and intermediate separation, as preferable to such 'stage reduction' as is obtained in the conical mill, for the reason that he uses the same mediums for further finer division of particles which have already divided them in the first mill. The principle of economy involved in all reduction is to successively reduce the energy as the particle is divided, for the energy necessary to divide a mass of matter is directly proportional to the particles of the mass, hence each division will require the application of less force. Again we will agree with Mr. Del Mar that stamps of 2000 lb. are encroaching upon the work of the rock-crusher, and one of 850 lb., that of the sliming machine. The 'stamps' we would advocate, based upon our experience during the past few years, should begin with a ball of 12 to 15 lb. weight acting directly upon the rock-crusher product and pass the resulting mass to gradually reduced weights down to one pound, or less. By figures, it will be ascertained that this one-pound ball has more effective action upon a 12-mesh particle than the 2000-lb. stamp upon a 2-in. cube of quartz; the latter system has a weight relation of about 2500 to 1, while the former is more than 20,000 to 1. It is the step reduction, such as this, that underlies the principles involved in the conical mill.

The real efficiency of any step reduction will be in direct proportion to the hard crushing surfaces exposed. Crushing with stamps involves the principle which confronted every metallurgist in his first ore reduction effort on the bucking-board. He will remember how he constantly cleaned the board, sieved and returned the coarse material for further reduction—not that he was seeking out any great principle, but simply knew he was expending unnecessary energy for which he was paying. After a few vigorous rubs, and a few drops of 'elbow grease'—from his brow—he sought the course of least resistance by cleaning his bucking-board and presenting a clean, hard surface for final reduction. Again we must agree with Mr. Del Mar, in theory, but in practice it would work about as follows: The stamp exposes crushing surfaces of shoe and die of about 60 sq. in. each, a total of say 120 sq. in., or in a stamp of 2000 lb. about 16 lb. of weight for each



square inch. this stamp with a 6-in. clear drop above a 2-in. cube of quartz, will (provided the die is clear of other material), easily reduce this size of cube to a fractured mass, the average of which will be finer than particles or cubes of less than ¼ in.; a reduction of 512 to 1. Reasoning upon this line, and as stated above, crushing resistance being proportionate to the particles of the mass, the next stamp in the series would be approximately 1/500 of the original, or a 4-lb. stamp. This we propose to furnish in a 3-in. ball with a crushing surface of 27 square inches, or 7 sq. in. of crushing surface for each pound of weight, or relatively 13,000 times that of the stamp, to say nothing of the proportionately increased amplitude of drop, which in the case of the '4-lb. stamp' again multiplies its efficiency many times. This relation of stamps to the multiplicity of balls, the decrease in the weight of the stamps to the decreasing weight of balls, and height of drop of stamp, offset by amplitude of fall or roll of balls, is illustrated in the following cut of a conical mill and a battery of stamps of different weights.

Even stamp advocates it would seem, must admit that ideal step-reduction would be successively reduced weight of stamps to crush material proportionately reduced. Even the smallest stamp illustrated, if it weighed but 100 lb., a ratio of 1:10, with the 1000-lb. stamp, would have an increased relation to the size of material to be reduced in its succession, as the fourth power of 500, or millions of times

greater than the original 2000-lb. stamp to its 2-in. cube. Thus it will be seen that even the practice obtained in the conical mill does not come anywhere near its theoretical efficiency owing to the interference of the already finely comminuted particles. At the same time it is a long step in the direction of automatic adjustment of power to work performed. We are of the opinion that this matter of exposure of clean, hard crushing surface, deserves careful consideration by the mill man, especially as metallurgy through the production and utilization of low-grade ores, is assuming a position of industrial manufacturing importance in contradistinction to the uncertain occurrence of high-grade ores with which mining has generally been associated. We are acquainted with an instance where an additional saving of ⅛ of 1% of copper content per ton is the basis for reconstruction of a plant involving the expenditure of a very large sum of money. This saving of an additional ⅛ of 1% seems small, yet in the case under consideration means a net gain of over $500,000 per annum at a lesser net cost than that at present.

H. W. Hardinge.

New York, September 30.

Annual Labor

The Editor:

Sir.—The time is approaching when the annual assessment work must be done on unpatented mining claims. Will you define what constitutes legal annual assessment, and can I charge the expense of reaching my mine to this?

Claim Owner.

Stockton, California, August 1.

The object of annual assessment on unpatented mining claims is to advance their development and thereby enhance the value of the property, incidentally promoting and stimulating the mining industry. The law permits actual work in the development of the claim to be charged to this account, but traveling expenses to or from the mine are not a proper charge, nor can the expense of maintaining a watchman at the property be credited to it. Excavating an open-cut, driving an adit, sinking a shaft, or doing any underground work on the claim, or in its vicinity, and even outside the boundaries of the location, are a proper charge, provided that in the latter case it can be shown that such work is actually for the direct benefit of the claim, such as a cross-cut adit. Machinery of any kind placed on the property may also be properly charged to annual labor. It must be remembered that no matter how much labor or improvements are placed on a mine in any one year, no more than $100 can be charged to the account of each claim benefited thereby, for that year. In other words, if $1000 be spent on a claim in the year 1910, no part of it can be credited to it for the year 1911. For this reason and to economize traveling expense some claim owners take advantage of the opportunity to perform a hundred dollars' worth of work on a claim in December for one year, continues the work into January to do the work for that year also.

Engineering Advice

The Editor:

Sir: There are those who believe that the services of a mining engineer are of value only when a mine is to be examined, a report made and a prospectus written with the report, more or less elaborated as a basis for the statements made therein. The average mine owner, whether he be a prospector, a miner, or merely a 'business man' who has bought a mine, not unusually feels confident in his ability to plan the equipment and development of his property without assistance from an experienced engineer. True, some of them do remarkably well, but these are the exception, for ordinarily these self sufficient gentlemen make mistakes which cost them 'a pretty penny' later on. I have in mind one business man who had been very successful in the conduct of a business with which he had grown up and the details of which he knew thoroughly. He went into mining—bought a claim in California, had a little work done on it, and then decided to equip it with a mill. A small mill was bought, and built on insecure foundations. The question of power he decided to his own satisfaction readily enough, as a stream of water was running down the canyon—part of the time. Sometimes it was a small stream, at other times a raging torrent. Wood was abundant and in this case would have been the most economical means of obtaining power by using steam, but the business man decided upon water as a cheaper and in every way a better source of power. He had a dam built in the canyon and laid a pipe-line about 2000 ft. long, from the dam to the mill, which gave him a head at the wheel of about 50 ft. The pipe was laid so that each section projected into that next above, instead of into that below, thereby increasing friction at the joints, and worse still, causing the pipe to draw apart soon after the water was turned in, but worst of all, he had too little head (of water) to generate sufficient power to run his mill. Then a heavy rain came which quickly filled the little reservoir back of the dam and likewise filled the pipe-line and water-wheel with gravel and grit. The entire installation was useless and the self-made engineer was 'all in' financially speaking. He could have secured experienced advice for a few hundred dollars and had a plant designed to suit the conditions and thus have been able to accomplish the object he had in view. All I could say to him when he unfolded his tale of woe to me was: "I told you so before you went into this without getting proper advice."

Samaritan.

Bakersfield, California, September 30.

[The above is not unusual, for we have known of similar occurrences elsewhere. They may be excused, to some degree on the part of a man of small means who endeavors to make his funds go as far as possible, but there are companies with large capital available that are possessed of this same parsimonious idea of economy, making costly blunders in the engineering features of their plans, learning too late that the engineer, as well as the laborer, is 'worthy of his hire.'—Editor.]

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Compressors may be operated underground, though such practice is uncommon. In such cases electricity is the best source of power.

Monazite occurs in regions of crystalline rocks, particularly of granite. The greater part of the mineral is obtained by sluicing in the same manner as for gold.

Drifts and cross-cuts in the mines of Western Australia do not require much timbering, as the rock stands well enough without it. This is usually the case in desert regions.

To prevent jamming raises should be cut at as high an angle as 50 degrees, this being about the best slope angle. Raises that are vertical jam more frequently than those at 50 degrees, or near it.

The Bureau of Mines publications and advance notices of bulletins and other papers to be issued may be obtained by those interested by mailing a request for them to the Director, at Washington, D. C.

Of clays it has been known since man first made his appearance on earth that some are plastic—capable of being molded into a shape, and to retain that shape—but very little is known of why this is so. It is supposed to be due to the presence of a certain amount of colloidal material in the clay.

Old boiler tubes which are merely rusted out at the ends may generally be utilized by re-threading and used as air or water pipes. Often they are thrown away as useless, but it is rarely the case that they will not withstand a pressure of 100 lb., or even more.

In case of low water in a steam-boiler, under no circumstances turn on the feed water, and do not disturb the safety valve. Cover the fire with wet ashes, or green fuel if no ashes are at hand, and close both the fire and ash-pit doors. Let the boiler cool, leaving all outlet valves as they are. If any damage has been done it can be ascertained by inspection when the boiler has cooled.

Calcium phosphate is utilized in making fertilizer. One of the largest deposits of this mineral is found on Christmas island, off the southwest coast of Java. In 1909 there were exported by the company working the deposits 105,481 tons, which was 3616 less than the previous year. The markets for this product were in Japan, Germany, Australia, and New Zealand. The mines are owned by an English company, and the manager is an American.

There are many places where a $20 concentrate has no commercial value owing to cost of transportation and reduction charges absorbing all that the concentrate contains. The cost of chlorination varies with the character of the material under treatment, the method of treatment (Plattner or barrel process), and the magnitude of operations—a large plant being able to work at lower cost than a small one. In the Pacific Coast States the cost varies from $6 to $10 per ton of raw sulphide. The extraction should reach 90% or over.

Hammer-heads occasionally get into rock-breakers either by accident or design. In either case expensive damage usually results. To avoid this, power applied may be so gauged that although it is capable of driving the breaker while crushing the hardest rock, it will come to a stop should a hammer-head fall into the machine; the power being insufficient either to break the castings or to longer run the breaker. Another plan is to connect the breaker with a fast and loose pulley by means of wooden pegs so that in case of accident the pegs break and no strain comes on the belt or power-line.

To catch water in a mine on the levels near the surface is always good business. In some mines the water is allowed to run down shafts and winzes to the bottom, because it is more convenient to raise it from there to the surface than from some higher level. This may be so, but it is also more expensive. If the volume of water lifted from a mine be calculated by its weight, times the number of feet it is lifted, reducing it to foot-pounds, it will be seen that it runs rapidly into large power requirement. The more this can be reduced, by lessening the height of lift, the less expensive will be the cost of handling the water.

The black sand, so abundant in many streams, varies in character, with the rock through which the stream has cut its way. Where the erosion has taken place in andesites, magnetite will be abundant in the stream. If through diorite or diabase, magnetite and ilmenite are usually characteristic. If in granite, titanic iron will probably be found, as well as magnetite. Where the stream has cut through serpentine chromic-iron is likely to be abundant, though magnetite is always present in serpentine. Occasionally the sand is chiefly grains of limonite or hematite, due to the cutting of beds of these minerals, and less frequently to oxidation of pyrite.

Miners as a class are not discriminating, even in the lines of their daily work. It sometimes happens that a mine superintendent concludes that he will make a change in the explosive used, with a view to accomplishing better results at lower cost. For instance, he may decide that 70 per cent would be more effective in certain ground than the ordinary 40 per cent dynamite. The miner, having become accustomed to the use of the weaker powder, will in nearly every instance, take as much of the stronger as he has been using under similar circumstances, making no allowance for the great difference in the force of the two explosives. His acts are nearly all controlled by habit and in all things pertaining to his work he is an ultra-conservative. Customs are hard to change and while the miner may be willing to be shown, he seldom is convinced that the new way is the better one.

Special Correspondence

KALGOORLIE, WESTERN AUSTRALIA

Recent Developments —Output Water Analysis — Local Foundries for the Mines

The Great Boulder company is putting in cast and west drill holes from the main north cross cut north of the main shaft to test the north end of its lease. This company has a large unexplored area at this end. The shoot of ore at the 1900 ft. level in the Lake View mine has been driven on 54 ft. sampling $11.28 per ton across the width of 7 ft. This shoot is very short although the width and value are all right. The Star mine is opening up fairly well at the 300 and 500 ft. levels. The Kalgurli reports profitable ore at 1650 ft., while some of the outside mines are opening in a satisfactory manner. It is probable that the Lancefield will close down soon for another remodeling of the mill. The various plants that have been working on this mine have never been successful. The ore is somewhat refractory, containing graphite and arsenic, extraction averaging 85%, at a cost of $4.50 per ton treatment. The same may be said of the Gwalia Consolidated, at Wiluna. This mine has an immense lode, but the average value is said to be but $5 per ton. The crushing and treatment plant are badly situated and poorly erected, and this ore is also refractory, as it contains arsenic and antimony. Bewick, Moreing & Co. advise the erection of an experimental plant to include a roasting furnace, to treat the sulphide ore. The mine will be worked on a small scale until the scheme of treatment has been solved. For the oxidized ore, there is a 20-stamp mill, sand and vacuum filter plant. The latter has proved a serious problem in dealing with the peculiar slime produced, and many metallurgists have failed, although it may be said that the plant was badly arranged. The Golden Horse Shoe announces its ore reserves at June 30, 1910, as 903,592 long tons, averaging $10.44 per ton. The Royal Commission on Miners' Phthisis has completed taking evidence at Kalgoorlie. Eleven hundred, out of 3000 miners, were examined by Dr. Cumpston, and also many men in the dry-crushing and roasting plants. Underground workings and conditions in the various mills were inspected. Over 2000 men have now been examined throughout the State.

The principal yields for July were as follows:

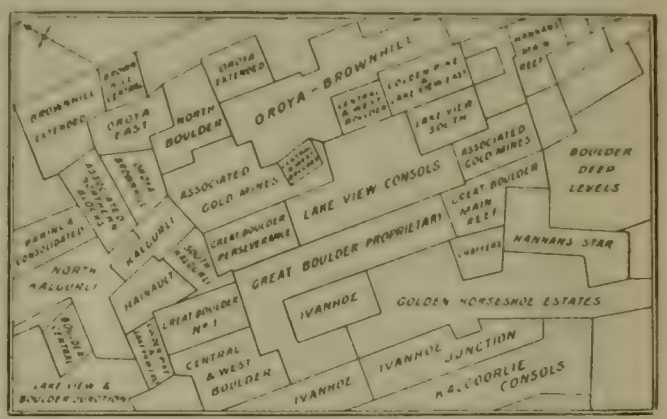
Name.	Tonnage.	Value.	Profit.	Dividend.
Associated	10,394	$75,000	$ 7,000	.....
Associated Northern	1,950	24,000	14,000	.....
Chaffers	4,255	32,000	1,600	.....
Golden Horse Shoe	22,682	160,000	7,500*	.....
Golden Ridge	2,400	31,500	10,500	.....
Great Boulder	19,454	245,000	122,000	.....
Great Fingall	10,927	82,000	12,500	.....
Hainault	5,862	39,000	5,000	.....
Ivanhoe	19,641	208,000	100,000	$250,000
Kalgurli	10,980	143,000	76,000	177,500
Lake View & Star	11,833	68,000	15,000*	.....
Lake View Consols	9,355†	8,000	2,300	.....
Oroya Brownhill	22,135†	30,500	18,000	.....
Oroya Black Range	4,600	46,000	12,500	.....
Oroya Links	11,310	79,000	18,000	.....
Sons of Gwalia	13,510	118,000	47,500	.....
Sons of Gwalia South	2,485	23,500	8,000	.....
South Kalgurli	9,380	59,000	8,500	.....

*Loss.

†From old residue.

Next month will see the Perseverance output included, as the new mill has been running for a fortnight.

The gold yield from the State in July was valued at $2,625,000, and dividends were paid amounting to $450,000. For the first six months of the current year the gold output was valued at $1[illegible] and [illegible] last year, while dividends paid were $2,[illegible] against $[illegible] for the same period of last year. To the imports for 1909 the sum of $78,000 is given in the customs returns for cyanide brought to the State. This has averaged $[illegible] for the last eight years. Taking the average cost at 18c. per lb., this equals 4,350,000 lb. of KCN for the treatment of 3,105,000 tons of ore by all mills in the State, or say 1.4 lb. per ton. In recently published returns on the various industries in Western Australia, the amount of lumber cut in the bush mills totaled 171,824,991 superficial feet, being mostly jarrah. In this district about 1100 tons of fuel are consumed daily. There were 10,212 tons of lime used in the various works, as well as 17,830,758 bricks made, fire and common. The Annual Report of the Mines Department just published, states that the total mineral output was valued at $35,250,000, that 3,105,000 tons of ore was



Principal Claims at Kalgoorlie.

treated yielding $33,850,000, nearly 96% of the total output; dividends paid by gold mining companies totaled $6,750,000; the area under mining lease for all minerals was 59,245 acres; 18,336 men were employed; the average tonnage raised per man being 194 tons; 6114 men are employed on the East Coolgardie field (Kalgoorlie district), and 1,740,779 tons was treated; 395 tons of tin oxide was exported, valued at $83,000; and $1600 worth of tantalite was raised on the tinfields, where it occurs as a stibio-tantalite; 15,086 tons of copper ore was mined valued at $475,000; the Collie coalfield produced 214,302 tons of coal worth $450,000; and 176,843 oz. silver was obtained; also three tons of asbestos worth $750.

During the month the Kalgoorlie group of mines consumed 31,046,000 gal. of water from the Water Scheme, about 1,000,000 gal. daily. The department has just published an analysis of the water:

Parts per 100,000.	
Ammonia, free	0.001
Ammonia albuminoid	0.015
Organic matter (O absorbed in 4 hr.)	0.0178
Nitrogen as nitrates	0.0065
Chlorine	16.5
Equivalent to NaCl	27.22
Hardness (°) temporary	1.75
Hardness (°) permanent	4.2

There is $155,000 being spent in a lime plant, the purpose of which is to add 5 grains CaO per gallon of H_2O to prevent the corrosion of the pipes; also in regulating tanks, and in making several alterations to the pumps.

Many mines have found that it paid to erect foundries and large shops, rather than to buy machinery and castings made in the Eastern States, at Perth, or at the foundries at Kalgoorlie. 'Spares' have been costly when buying from machinery firms, and there is no doubt that these latter have made money in the past judging by the difference in the cost of turning them out on the mines. From rock-breakers to the idlers on conveyors in the mills, ex-

LONDON

El Oro Mining & Railway Co. — Mexico Mines of El Oro. — Aluma Mines. —Rhodesia Exploration & Development.

The stock of the El Oro Mexico continues to be the favorite speculative issue on the London market. The El Oro Mining & Railway Co. was formed in 1900 to acquire the El Oro gold mine from an American company of similar name. The property was developed to a depth of 1,000 ft. by the latter company, but it proved unprofitable for the reason that the ore was refractory and could not be treated by the cyanide process. The company failed to secure the Mexico mine and the Esperanza mine on the other side of the Esperanza hill and the Socorro mine, but it is making progress in the west. The latter was developed from a depth of 1,000 ft. to 1,600 ft. by the Mexico Co. The ore reserves now stand at $1,250,000 and $1,000,000 has been spent in development. The report for the year ended December 31st last showed that the mine was responsible for the entire output of the company in February. This was caused by the cessation of mining operations on the Esperanza, and the concentrating of the ore from the Mexico mine. The ore is now being treated at the rate of 1,000 tons per day, and the profit for the year was £200,000. The ore reserves are estimated at 1,000,000 tons, averaging $10.00 per ton. The ore is treated by the cyanide process. The cost of mining and treating is $5.00 per ton. The

the Rhodesian Exploration & Development. It may be noted here that the Shamva and Gold Belt companies have since recently been formed. The Rhodesia Exploration & Development is a profit earning company and has large cash assets. The four other companies have also large sums of working capital. Further capital is to be raised by issuing 250,000 new shares at 12/6 each which have been guaranteed by Abe Bailey. The total working capital and realizable resources will be £1,600,000. The plan has been approved by the shareholders of the various companies.

NEW YORK

Political Influence on the Market. — Coppers — Texas Oil Company.

The political situation has kept the stock market marking time. There has been a much better tone prevailing slightly higher prices and a moderate increase in the volume of trading, but on the whole business has been subordinate to politics and the Saratoga convention. So far as the market for mining securities is concerned the crusade started this week by the Federal authorities to clean up the New York Curb is by far the most important event which has occurred for months. The offices of B. H. Scheftels & Co. in New York, Chicago, Boston, Milwaukee, and other cities were closed as bucket shops this week, the heads of the New York house and the managers of the various branch offices held for fraudulent use of the mails. The ruling spirit in the house of B. H. Scheftels & Co. was George Graham Rice, whose publicity campaigns have from time to time attracted the attention of the whole country, and whose career has been thoroughly aired repeatedly. Since the establishment of the house of Scheftels, Rice has been carrying on spectacular campaigns in Ely Central, Jumbo Extension, Rawhide Coalition, Rawhide Queen, and other issues. To sell these issues fortunes have been spent in advertising and it has been repeatedly stated that the house was doing more business than any three houses in the Street including the members of the Stock Exchange. The end was a natural one and wholly inevitable. The operations of Rice, while conducted on a large scale were not in and of themselves of so great importance as was the effect upon the general market. The New York Curb has become the natural outlet for the country's mining securities, and if properly protected, will quickly become a market second only in importance to the New York Stock Exchange. The unhindered action of the Curb bucket shops has, however, in effect, prevented the distribution of securities on the Curb and the demoralization of the Curb market has been complete for some months. If the Federal crusade is made complete and effective a rapid and extremely beneficial improvement may be confidently expected. The various issues manipulated by Scheftels & Co. broke sharply after the raid by the police, who arrested the principal officials and confiscated the books and locked the office doors. A special meeting of the Braden Copper Co. has been called for October 8, to approve the issuance of a $2,000,000 convertible bond issue. One-half of the issue is to be sold at once and the proceeds to be immediately expended in the completion of the water-power plant and smelter, and the enlargement of the concentrator, the balance of the issue will be held to build a leaching plant and to provide working capital when necessary. The bonds will be offered at par, they are subject to the present outstanding issue, are callable at $110 subject to the right of the holder to convert them into common stock. The first annual report of the Ray Consolidated Copper Co. bears out the prediction that this property is to become another Utah. The developed ores including those of the Gila, recently absorbed, are calculated at 75,000,000 tons. Operations are to begin during the early part of the coming year on a basis of an annual output of more than 80,000,000 lb. of copper. Chino has been the market leader of the Coppers during the past week. The shares reached $19, a record high mark. The National Mining Exploration Co., with properties in Gila, Pinal, and Graham counties, Arizona, which has been traded in Boston to some extent, has filed a voluntary petition in [illegible] giving liabilities at $[illegible] assets $[illegible].

The report of the Texas Oil Co. the great oil concern which has been built up by John W. Gates since his retirement from Wall Street made to the listing committee of the New York Stock Exchange shows gross earnings for the year last past of practically $10,000,000. Oil on hand crude refined and in process of manufacture to the amount of $6,557,242 other assets are pipe lines, $9,188,000 tank steamers tank cars terminals and distributing stations $5,235,000 refineries $4,045,000 which with other smaller items brings the total to $32,901,866. Mr. Gates' company has complete control of the new field at Caddo, Louisiana, and is a large factor in the Oklahoma and Kansas oilfields.

ELY, NEVADA

Nevada Consolidated Curtailment.—Giroux.— Ely Calumet. — Boston Ely-Ely Consolidated.

On the first of September an order went into effect at the Steptoe plant to shut down the concentrator on Sundays, and in addition to this one-half of the big plant is down all of the time, which has materially decreased the tonnage of ore treated. In fact, during the entire month of September the daily output of ore from the mines will not average more than 5500 tons, as against an average

Drilling in an Ely Mine.

of between 9000 and 10,000 tons during July and August. It was understood by orders issued from the New York office of the company that the reduction would not amount to more than 15%, but at the present time only about 50% of the ore formerly treated is going through the concentrator. But notwithstanding this fact the outrun of copper will equal, if not surpass, all former months. This is due to the fact that the capacity of the concentrator is far in excess of that of the furnaces, and consequently there was a large supply of calcined ore and concentrate on hand when the order was made for reduction. However, the smelter is now rapidly gaining on the concentrator. During the present week five furnaces have been in steady operation, and the reserves are being drawn upon heavily. The Nevada Consolidated company is opening its new Liberty pit with a rush, and the chances now seem probable that it will be in a condition for production by the first of the new year. Only one steam-shovel is being employed at the present time, but another will soon be put to work. It is

also probable that the Veteran mine, which has been closed down for more than a year, owing to labor troubles, will again be opened. The Nevada Consolidated will need the dry ores from the underground working of the Veteran during the winter months when the ores from the pits are frozen, and therefore difficult to handle.

All surface work at the Giroux property is progressing satisfactorily. The steel engine and boiler rooms are rapidly assuming proportions and the steel head-frame over the big Giroux shaft will soon follow. The buildings will be completed before cold weather commences, after which the cross-cut from the 1200-ft. level will be started for the old Alpha workings, which will be reached in about two months' time. While this is going on the big pumps will be put into position on the 1200-ft. level. It has been announced by the management of the Giroux company that its plant, when erected, will be at or near the mines, but no intimation has been made as to when construction work will be commenced, though it is reasonably certain that nothing along these lines will be undertaken before spring. The company has had four churn-drills at work all summer prospecting new territory, and it is understood that the results have been entirely satisfactory.

S. C. Constant, of New York, arrived in the district Saturday last and has been inspecting the Ely Calumet property, with a view to taking over a controlling interest in the company from A. Meyers, Thomas Rockhill, and G. L. (Tex) Rickard. The property has been operated under lessees during the past few months, who have brought in some fine showings of ore. The company has done nothing in the way of development for some time past. It is thought that a change of management will be beneficial to the stockholders. E. C. Chase, a mining engineer of Denver, has been spending some time at the Boston Ely, giving the property a careful examination. It is said that his report will be favorable to the further exploitation of the property by diamond-drill operations from the 1200-ft. level, as this is undoubtedly the cheapest and quickest way to prospect the ore. The Ely Consolidated is installing a pumping plant on its Zack mine near the Star Pointer shaft of the Nevada Consolidated. As soon as the pump is in operation the main shaft will be sunk as rapidly as possible, to the depth of several hundred feet during the present winter, and a large tonnage of ore blocked out below water-level.

BUTTE, MONTANA

September Production.—Heinze Properties.—St. Lawrence Closed. — Butte & Superior to Issue Bonds.—Tuolumne-North Butte Suit.

The Butte mining companies produced approximately 23,000,000 lb. of copper in September against 24,762,800 in August, the September production being between 4,000,000 and 5,000,000 lb. below the normal average for the district. The different companies contributed to the totals as follows:

	Monthly Ore Tonnage.	Monthly Lb. Copper.
Boston & Montana	90,000	6,300,000
Anaconda	126,000	7,812,000
Butte & Boston	15,000	930,000
Washoe	12,000	732,000
Parrot	3,750	236,250
Trenton	12,900	799,800
North Butte	30,000	1,890,000
Butte Coalition	37,500	2,550,000
Original	15,000	960,000
Tuolumne	3,000	210,000
Butte Ballaklava	900	90,000
East Butte	6,000	480,000
Totals	352,050	22,990,050

On his return from Idaho after an inspection of his Stewart property, F. Augustus Heinze spent several hours in this city before leaving for New York to take the steamer for Paris where he goes to complete the arrangements for the sale of Ohio bonds. "I am highly pleased with the conditions existing at the Stewart mine," he said on his return to this city. "The Stewart is earning gross about $35,000 and $15,000 net per month on 250 tons of ore shipped per day." When asked about operations at the Colorado mine of the Davis-Daly company, Mr. Heinze replied: "While here I have devoted considerable of my time to a thorough inspection of the mine and am well satisfied with conditions. The 1700-ft. level is being opened and the cross-cut from the Colorado to the Hesperus is still being extended, though nothing of value has yet been found. However, the 1700-ft. level is showing up better than the 1500 did, though not so well as the 1400. The vein is narrower, the width being from two to five feet, but the value is about the same as on the 1400." Those who expected to learn something concerning the sale of the Hypocka company to Thomas F. Cole for $25,000 through the examination of F. Augustus Heinze were greatly disappointed, as the citation calling Mr. Heinze into court to tell about the transaction, was dismissed.

The St. Lawrence mine of the original Anaconda group has been closed down and it is not expected active mining operations will be resumed again for at least two months. This is due to the big ore-house alongside the mine containing about 3500 tons of ore sliding down the hill and being utterly demolished. The ore-house was twenty years old and the question of constructing a new one was under consideration. Advantage of the enforced shut-down of the St. Lawrence will afford an opportunity of re-timbering the shaft and this work will be commenced at once. This close down, it is stated, will not mean any decrease in the output of the original Anaconda group as the production of the other mines will be increased to about 1000 tons a day, which was the output of the St. Lawrence. Plans are already being prepared for the erection of a new ore-house of a substantial and modern character and work will be commenced just as soon as the plans are ready. The work of preparing a foundation has been commenced and the intention is that not any time shall be lost in restoring the building. All the men employed in the St. Lawrence will be divided among other mines.

The Butte & Superior continues to make regular shipments to the Basin concentrator and the directors believe they have found a way out of the financial difficulty which has been hanging about the company for several months. It has been decided to issue $1,000,000 6% semi-annual refunding and improvement bonds bearing date September 20, 1910, to mature September 20, 1920. These bonds are to be first offered to stockholders and are convertible into the stock of the company at par, which is $10 per share, during the five-year period from their date of issue to September 20, 1915. It is provided that there shall be paid $125,000 per annum into a sinking fund on or before September 20, of the years 1913 to 1920 inclusive. It is also stated that the first call for retirement of the bonds shall not occur prior to September 20, 1915. Stockholders have a prior right of subscription to the bonds at par, pro rata as to their holdings of record up to and including October 20, 1910, after which time all bonds remaining unsold over and above the pro rata subscription by stockholders, will be allotted to stockholders who may have heretofore tendered a subscription in excess of their pro rata share. If there are still bonds unsold the same will be offered to the general public. The bonds will be issued in denominations of $50 and multiples thereof. The stockholders are now receiving blanks on which to make application for the bonds. The money derived from the bonds will be used in refunding and improvement of the property, it being the intention under the latter head to construct a mill on the company's property to treat the ore.

The Butte-Ballaklava company is doing a large amount of development outside of the ground in dispute and is shipping about 150 tons of ore per day to the East Butte smelter. The Tuolumne Copper Mining Co. has filed its answer to the North Butte Mining Co. in the suit brought to recover ground alleged by the latter to be its property. The answer makes a general denial of the claims set forth by the

North Butte company and charges that the North Butte has extracted large quantities of ore from the eastern portion of the Tuolumne and from the so-called compromise strip belonging to the Tuolumne company. The Tuolumne asks for an accounting of the ore alleged to have been taken from the Tuolumne property by the North Butte and in addition an injunction is asked against further extraction of ore from the property in question. The answer declares that a great portion of the ore which has been extracted by the Tuolumne company is from the compromise strip and denies that the North Butte has a three-eighths interest in this strip or any interest at all and claims that the deed obtained by John G. Morony for the North Butte company does not convey any interest whatever. It is further alleged in the answer that the entire interest in the compromise strip has been claimed and possessed by the Tuolumne company for many years and that the company has paid all taxes on it and spent large amounts in developing it and making it valuable. It is stated that neither Mr. Morony or his grantor has contributed anything toward development or any other expenses and that it was only within the last year when the strip was found to be valuable that any claim was made by the North Butte to a small interest in the property. It is also set up that the North Butte company and its grantors are barred by laches from making any claim to any portion of the compromise strip. It is alleged that the Tuolumne is an older location than the Jessie, that the ore in the compromise strip belongs to a vein apexing in the compromise strip and that the apex has been clearly developed and that the Tuolumne claim has the ore in this vein below the point near the 400-ft. level, where it is probably joined by the Jessie vein. The answer further states that the development has not been made on the extreme western end of the Tuolumne and Jessie lodes to the extent necessary to determine whether or not the great orebodies belonged to the Jessie or the Tuolumne, but declares that if development shows that the ore belongs to the Tuolumne it will make claim against the North Butte for the same.

DENVER, COLORADO

Activity at Leadville.—Demand for Silicious Ores.

The recent discovery, or rather recognition, of large reserves of zinc carbonate in the abandoned workings of several of the older mines of Leadville, has had quite an astonishing effect upon the general state of affairs in that famous camp, and recalls the circumstances that led up to the recognition of the wealth of the district in lead carbonates in 1876-1877. Leadville lies in California gulch, and the latter, in 1861, was a booming gold miner's 'Happy Valley,' which, for several years, until the cream had been well skimmed off, turned out from two to three million dollars worth of gold dust during the short placer mining season possible at the altitude, which is high above sea-level. But its miners were always more or less troubled in their operations by the occurrence in the sluice boxes of a heavy gray sand, that would lag behind and fill up the riffles, adding greatly to the difficulties of cleaning up. No one seemed to know what it was, and all were too busy to investigate. A dozen years later, however, when the locality had faded to the status of a mere memory, the story of this material drifted accidentally into the ears of a certain Mr. Wood, of Detroit, who, having had considerable to do with lead carbonates in Nevada, and being of an investigating turn of mind, was moved to proceed at once to the almost forgotten camp and to verify the story and examine the slopes of the ravine. The result was the location of outcrops of the great silver-lead deposits that in a few months made the locality famous. And now it is being proved that for many years past, in a number of the mines, miles of drifts have been run in, or alongside of, or above, or below large bodies of zinc carbonate, under the impression that the stuff was merely an unusually heavy kind of porphyry. It is a little too early yet to say how much of this very desirable ore is immediately available for extraction, but some careful investigations have been made in the properties of the Western Mining Co., which include the Wolftone, Maid of Erin, Adams and other well known claims in the vicinity, by a representative of one of the large Mississippi Valley smelters and his conclusion is that a production of 300 to 500 tons per day is available with little effort from this ground, with the probability that such an output can be maintained for several years before the bodies already in sight will be exhausted. Since this news was made public there has been a wonderful amount of poking around in the old levels and drifts of the mines of Carbonate and Iron hills, and a lively demand for leases on many partly or wholly abandoned claims. Some of the big waste dumps are also being examined with encouragement or success. Considerable zinc silicate is being detected along with the carbonate, or in masses by itself. In some of the bodies of both kinds the ore is remarkably pure and clean, so that a product closely approximating 50% of metal can be produced in quantity. In others there is an uncomfortably large iron content, which will materially lower its commercial value.

North American Smelter, Golden, Colorado.

In still others there is an admixture of lead carbonate or sulphide, which must be separated before the material can be marketed. But, taking all these matters into consideration, and making due allowances for the inevitable exaggerations that accompany all new discoveries, there is yet good ground for believing that the output of zinc ore from Leadville during 1911 will exceed anticipated results. It is considered remarkable that this material has remained unrecognized for so many years, during which the principal underground workings of the larger mines have been examined and studied again and again by well known geologists and mineralogists. And it is now recalled that in the early eighties, when the great bodies of ferruginous lead ore were being taken out, a considerable percentage of a heavy gray-white mineral of a very objectionable character was often met with, at the time, was rather hastily considered to be barite by the smelters, but it is now known that this mineral is exceedingly rare, if not entirely absent from the Leadville ores, and the inference is that it was zinc. The incident illustrates the easy going smelting methods in vogue twenty years ago. But in those days, when smelting charges ranged from $20 to $30 per ton on oxidized ore, and no one thought of demanding anything for the gold content of their ores, the margin of profit was large enough to cause such matters to be overlooked.

In their distress for silica the smelters of the State have been cutting the working charge on Cripple Creek ore for some time past, and drawing it away from the mills there, and at Florence and Colorado City. The latter have now been compelled to follow suit, to maintain their supply. Rates are now down to $6.50 per ton on $40 ore, and $7 on $40 to $60 material. These are remarkably good figures for the miner and are still profitable for the mills. It will result in a decreased flow of the highly silicious mineral of the district to the smelters.

General Mining News

ALASKA

The Alaska-Treasure gold mine on Douglas island is undergoing vigorous development, in direct charge of Theodore Harper. In driving the deep cross-cut, now in 2700 ft., the intermediate lode was bisected last month, opening an orebody 50 ft. wide which samples $4 per ton. The main Treasure lode will probably be intersected by driving 1000 ft. farther. Development is to be continued during the fall and winter, and a stamp-mill of 1000 tons daily capacity is to be erected at the property next year.——Pearse, Kingston & Browne, of London and New York, consulting engineers for the Alaska-Perseverance Gold Mining Co., of Juneau, have recently declined to continue longer in that capacity in consequence of serious differences on questions of policy as to the methods of handling the property.

ARIZONA

GILA COUNTY

(Special Correspondence).—Three churn-drills are in operation at the Inspiration property on the Pinto Colorado and Apex claims. There are 200 men employed underground and about 30 working faces are being constantly pushed forward. The main extraction adit the mouth of which is in Keystone gulch and which runs into the Joe Bush shaft is 2200 ft. in length and has been driven in exactly four months. It was driven from both ends and two 3-in. drills were used in each face.——The Miami company is working in the neighborhood of 100 men underground and 300 on the surface. Three drills are developing the property further to the west and attempting to find the limit of the orebody.

Miami Mill Under Construction.

Miami, September 29.

MOHAVE COUNTY

The first section of the Golconda mill, with a capacity of 40 tons per day, has been completed and trial runs made during the past week have proved highly satisfactory. The plant is a standard concentrating mill with crushers, rolls, jigs, and Wilfley tables. John Boyle, the manager, estimates the total of the milling ore already broken in the stopes and on the dumps at 30,000 tons worth about $8 per ton. Work has been started on the second section of the mill and 80 tons per day will be handled by November 1. In the meantime shipping is continuing steadily at the rate of 600 tons of 48% zinc ore per month. In the Tub mine, owned by Mr. Boyle personally, development has been stopped pending the erection of a large mill for the treatment of the Tub ore alone.——Driving east from shaft No. 2 on the 500-ft. level of the Gold Road mine has disclosed still another ore-shoot with about seven feet of good milling ore.——The Tom Reed mine paid its second dividend of 3c. per share several days ago. The 10 stamps are crushing about 45 tons per day, averaging a little over $40 per ton. The stamps of the old mill are to be moved up to the new and will be put into operation as soon as possible.——At the Ruth mine the new shaft at a depth of 30 ft. is in better ore than that found in the old at a similar depth. Since cyanide tests made by Daniel Bosqui, mill superintendent of the Gold Road, proved an extraction of only 58%, all idea of an extraction by percolation alone has been abandoned, and thorough mill tests of the Ruth ore are now being made by the Young Construction Co. of Los Angeles. A plant similar to that of the Gold Road will probably be erected.

CALIFORNIA

CALAVERAS COUNTY

A shoot of ore has been opened by T. Porteous in the Old Cheek mine near West Point at a depth of 70 ft. and five tons of material has been placed on the dump.——The Haley brothers have driven a drift on the vein at their claims in Mott gulch and are storing $50 ore for shipment.——The shaft at the South Australia mine is down about 70 ft. in ore which pans well.——It is reported that operations are to be resumed at the Moser mine in the Mokelumne Hill district.——The Caloro Mining Co. is developing a group of gold-copper veins just south of Campo Seco. Several shafts and adits have been driven in ore which runs from a few dollars to upward of $200 per ton. It is proposed to ship the ore now being mined. W. H. McClintock is manager.

MARIPOSA COUNTY

A break in the flume at the Hasloe mine has stopped work for a few days till repairs can be made.——The bond which P. G. Gow held on the Champion property has expired and the mine has been closed down.——A good body of milling ore is being opened at the old San Domingo mine on Bear creek five miles from Briceburg. R. L. Mann is superintendent.——A syndicate of Eastern men has been formed to work the McCall and Tucker placer ground a mile and a half above Merced Falls, and machinery has been shipped to the property to raise water for the sluices.

NEVADA COUNTY

The office buildings at the Providence mine which is one of the Champion Mines Co.'s holdings were destroyed by fire. The flames were fortunately checked before the mill buildings on the property were reached so the damage was not serious.——During the summer 1200 ft. of flume has been constructed and 800 ft. of pipe laid at the Andy Fitz mine near Moores Flat. The new compressor has been set on its foundation and active mining commenced.

PLUMAS COUNTY

The Gold Mountain Hydraulic Mining & Dredging Co., under the supervision of George W. Flagg, is building a large dam near its property on Willow creek and preparing for extensive operations in the spring.——Preparations are under way for the unwatering of the Franklin shaft at Nelson Point. The shaft is down 200 ft. and was sunk about thirty years ago when the operators were forced to abandon the work on account of an excessive flow of water. It is thought that a small amount of work will open the channel.

SHASTA COUNTY

The furnaces at the Balaklala plant of the First National Copper Co., at Coram, have been blown in and the Cottrell plant is successfully handling the smoke. The ore-bins at the plant are full of ore but as soon as this can be lowered operations will be started at the mine and the tramway put in motion.

SIERRA COUNTY

The Empire mine in Gold valley has been closed for the winter as the cost of hauling in supplies during the wet season is excessive.——Charles R. Thompson has let a contract to move some of the buildings at the Mountaineer mine to the Colombo near Sierra City which he is operating under bond.——Horace Cleland and S. Chastine have opened a streak of pay-gravel at their claims near Poker flat.

SISKIYOU COUNTY

(Special Correspondence).—The Aiken-Graham Co. of San Francisco has installed a steam shovel on the Dagget placers at Oak Bar, on the Klamath river, and will commence operations within a few days. The ground has been

thoroughly tested and there are several thousand acres of land containing auriferous gravel. The Moet brothers have completed a wing dam on their property on the Klamath and have commenced pumping. Considerable high grade gravel has been opened. At the Highland mine the recently organized company is arranging for vigorous development. McDonald, White & Armstrong have discovered a vein of gold-copper ore two miles below Oak Bar.

Yreka, October 4.

TUOLUMNE COUNTY

(Special Correspondence.)—The Spring Gulch mine, situated four miles south of Tuolumne, has been bonded to Colorado capitalists. Tools and all necessary supplies are being hauled to the property and active operations will be commenced at once.——Development is in progress at the Rising Sun mine at Arastraville, and extraction of ore has begun. The tunnel is undergoing repairs and will be started in the near future.——The management of the Jumper mine has purchased several new machine drills and is making preparations for carrying on operations on a much larger scale. More than 50 men are at present on the pay roll, but most of these are employed in surface work.——Operations have been temporarily suspended at the Maddox mine near Confidence. It is said negotiations are in progress for the sale of the property, and it is understood that should this fail a larger mill will be installed by the owner, John Frey, and the mine then worked on a more extensive scale.——An underground hoist and an air compressor have been installed at the Duffield, near Arastraville, and the work of erecting a 10-stamp mill is progressing rapidly.——Repairs and improvements are being made in the Harvard mill, among which is the putting in of concrete mortar blocks. During the progress of this work a number of stamps are of necessity hung up, only 40 of the 60 now being in operation.——It is reported that operations will probably be resumed at the Santa Ysabel.——Work will be resumed at the Donella, above Arastraville, in the near future.——At the Toledo mine, west of the Rawhide, a small crew of men is employed in development.——The Green Horn and One Chance quartz claims near Rawhide have been bonded to W. T. Watson who will immediately begin the development of the properties.——It is reported that development work will shortly be resumed at the Mariana copper mine, near Chinese, by A. Elliott of Modesto.——The Ruby Hill Mining Co. is preparing to resume work at its gravel property in the Jupiter district. A new shaft will be sunk, the hoist to be operated by steam power.——Articles of incorporation of the New Providence Gold Mining Co. and the East Belt Gold Mining Co. have been filed in this county. The capital stock of the former is $250,000, the directors being S. P. Hammond, C. S. Wong, J. F. Bluett, C. Bluett, and J. D. Hammond; that of the latter $100,000, the same men constituting the directorate, excepting C. S. Wong, whose place is taken by William Bluett.

Tuolumne, September 3.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence).—A streak of ore 3 to 5 in. wide has been uncovered on the Seven-Thirty vein that assays 2106 oz. silver and 1.10 oz. gold per ton.——Charles Oklun, owner of the Scott mine on Republican mountain, has resumed development. Shipments of galena containing 65% lead and 40 oz. silver per ton have been started.——The Jewell mill at Silver Plume has been sold to the Little Gilpin Mining Co. and the plant is to be dismantled. The machinery will be shipped to the property of the company in Gilpin county.——Work was put under way last week on the McKinley property on Lincoln mountain. S. D. Tibbetts, of Denver, is manager.——James Beshears, owning the Esconado and Rex properties, returned this week from Colorado Springs. He states that a working fund of $32,000 is to be provided.——Construction on the new mill for the Santiago Mining, Milling & Tunnel Co. was started this week. The sampling department will be completed first. Wm. Rogers is manager.

Georgetown, September 30.

GILPIN COUNTY

(Special Correspondence.)—The Leidhigh property in the Vermillion district has been entered among the list of shippers. The last shipment netted 4 oz. gold per ton.——A new Norwalk compressor was received at the Seemann adit last week. It is announced that this adit will be continued for 2000 ft. H. K. Seemann of Denver is manager.——New machinery has been installed at the London mine at Twelvemile. Lead & O'Connell are operators.——The Montana Hill Tunnel Co. has awarded a contract to drive an adit to intersect the series of veins.——The water in the Gunnell mine is lowering at the rate of six inches per day. A number of lessees are at work in the upper levels and heavy shipments are going out.

Central City, October 1.

IDAHO

SHOSHONE COUNTY

Reports from Mullan state that the drift on the Missoula Copper Co.'s property is now in 40 ft. and that a foot of shipping ore has been exposed the entire distance. The rest of the ore opened is high grade copper of milling character. The adit has not touched either wall so far and the width of the ore shoot is uncertain. The Missoula lies in the immediate vicinity of several prominent copper mines, including the Snowstorm, the Snowshoe, the Lucky Calumet, the National Copper, and the Independent, through whose workings the discovery on the Missoula was made. R. C. Vanderfoot, formerly expert for Finch & Campbell, of Spokane, says that the recent find is important, adding: "The whole face now is in ore that will average between 6 and 7% in copper, with a still greater percentage of lead. The copper occurs in the form of oxide and chalcopyrite and the lead as galena."——Lead-silver ore reserves of an estimated value of more than $5,000,000 are reported to be in sight on the Marsh property at Burke, which will enter the list of producers within 60 days. The mine is owned chiefly by business men of Butte, Missoula, and Spokane. Five feet of ore, 50% of which is of a shipping grade, averaging 60% lead and 54 oz. silver per ton, has been exposed on the present lowest level, which is above the levels at which the Hecla and Tiger-Poorman mines showed their worth. The rest of the vein on the Marsh property is concentrating ore, averaging 15% lead and about 13 oz. silver.

MISSOURI

JASPER COUNTY

(Special Correspondence).—There is quite a large amount of prospecting and development in the northern part of the county. On the Weaver land near Neck City drilling is being done on an 80-acre lease and at a depth of 40 ft. encouraging prospects have been struck. This territory is near the Quick Seven tract, which has been developed during the past two years and is still practically virgin land. The grade of ore in this vicinity is among the best ever mined in this entire district, averaging over 60%, and commanding above the market basis price. Some of the ore in the Quick Seven mines contains 64% blende.——The Quick Seven Co. has completed a shaft to the ore-level which was started some time ago and abandoned at 40 ft. Drilling near it has shown the tendency of the ore in that direction. The shaft will be connected to the mill by a tramway and ore will be taken from both workings. The output for September from this mine averaged 20 tons per day.——The fourth mill on the Quick Seven lease has been built with the completion of the T. S. & J. plant, a mill moved from the Glass lease in the Webb City district. The development at this mine has been quite extensive and a large boulder pile has accumulated awaiting the erection of a plant. The workings here are in comparatively hard ground, requiring little timbering.——To the south of this camp the Oronogo Circle Mining Co. is preparing to take up a large stope over the entire workings, a move which will make the drifts over 100 ft. high. They are already between 50 and 60 ft. in height. This company has been experimenting with the core-drill in the place of the regular churn-drill and has proved it very satisfactory as show-

ing the character of the formation better than the old method. Cores from 2 to 3 ft. long were removed. The core-drill was set up in the old drifts which were 235 ft. below the surface and the holes were sunk to below the 300-ft. point.

Joplin, October 1.

NEWTON COUNTY

(Special Correspondence).—A number of properties are busy in the Spring City camp, some with additional prospecting and others with the preliminary work attending the reopening of closed mines. The Amarillo company which recently took over the old Microbe mine has started drilling in the western part of the lease. Development hitherto has been confined to the eastern part of the land. The ground has been drained to the 116-ft. level and a 4-ft. stope will be taken up over the entire workings. There is a small 100-ton mill on the lease.——The Sunrise company has begun the drilling of a series of holes west of the present workings to determine the extent of the ore. In addition to this prospect work the U. G. Wilson company is sinking a new shaft on the south side of the lease and prospects are so encouraging that it is probable that the mill will be removed to the new shaft. Ore has also been developed in drill-holes on the western part of the lease.——The Mary E. mine has made a good record as a producer recently under the management of C. C. Playter. Drifts are being run to the south and west. The shaft when sunk, opened ore on all sides in a 50-ft. face. Only the lower 25 ft. is worked as the upper 25 was not so rich. Operations are conducted at the 120-ft. level. The company is now beginning to take up a 5-ft. stope over the entire workings.

Spring City, September 30.

NEVADA

ESMERALDA COUNTY

The report of the engineers on the Jumbo Extension ground, at Goldfield, estimates that there is approximately $3,000,000 worth of ore available in the underground workings.——Development on the 300-ft. level of Wheeler lease on the Spearhead ground continues to open pay ore and a second lease has been granted on a part of the property.——Steady development is continued at the Combination Fraction though no new ore has been opened.

LANDER COUNTY

(Special Correspondence).—The new mill of the Austin-Manhattan Co. is rapidly nearing completion, the dryer having been completed and everything placed in readiness for the installation of the other machinery. The Ophir shaft has been retimbered for 175 ft. The Jack Pot shaft is going down rapidly and is now about 50 ft. below the 200-ft. level. The east cross-cut from this point is out 260 ft. and is being driven to intersect the Silver Chamber vein and other orebodies lying between the Jack Pot and Silver Chamber shoots. The company is shipping in large quantities of fuel and supplies and the coming winter promises to be a busy one. The mill will probably be in operation this winter.

Austin, September 30.

NYE COUNTY

(Special Correspondence).—The Indian group of claims, which is being operated under lease by R. E. Clapp and A. K. Ishmael, is situated on the southwest slope of the Funeral range about two miles below Keane springs and seventeen miles from Rhyolite. In a gulch heading at the summit of the range a dam has been placed which retains sufficient water to supply the camp and the mill which at present consists of a 1350-lb. Nissen stamp with inside amalgamation and a New Woodbury table. Power for both pumps and mill is furnished by gasoline engines and it is the intention of the lessees to add another stamp to the plant in the near future. The mill is of substantial construction, all the foundations being of concrete. The stamp has a fall of 6 in. dropping 102 times per minute. The principal vein is on a contact between a schist and a silicious limestone, the former being the hanging wall. It is comparatively flat and averages about three feet in width, the pay-streak varying between 12 and 15 in. The richest part of the vein is near the hanging wall and shows considerable free gold although it is accompanied by a streak of galena. It is developed by a number of drifts and the ore from the stopes is trammed in cars to the mill where it passes over a grizzly to a crusher and then to the ore-bin. The ore is said to mill $16 to $18 per ton. A fairly complete assay laboratory has been installed a little above the mill and the plant seems to be a complete success although the costs are high on account of the limited capacity.——A. S. Burns, who has a lease on the Hartford property about two miles west of the Indian group near the base of the range is stacking ore which will average about $40 per ton and will pack it on burros to the Indian mill for treatment.

Rhyolite, October 1.

The Tonopah Mining Co. has declared the regular 25c. per share with an extra one of 15c. per share, payable October 21. This will distribute $400,000 among the stockholders and make the total for the year $1,500,000. After the payment there will still be over $1,000,000 in the treasury of the company.——The last raise on the ground of the Round Mountain Mining Co. at Round Mountain has opened a flat vein which assays $8 to $14 per ton and adds a large amount of ore to the company's ground outside the territory in dispute.

OREGON

JACKSON COUNTY

(Special Correspondence).—The Pleasant Creek Gold Mining Co. has had a preliminary examination of its ground by Otto L. Haese. The company owns, or controls, 700 acres of placer ground south of Battle mountain. The mines are reached from Woodville on the Southern Pacific by a fair road of 12 miles. Wood and water for working the ground are abundant. The gravels extend from Battle mountain to the north, to the former town of Wimer on the south, and are limited by the mountain spurs east and west. The bedrock is decomposed granite that forms natural riffles. The overburden of sandy clay averages 5 ft. and carries 10 to 30c. per cu. yd. The gravel attains depths of 5 to 20 ft. with an average of 8 ft., and carries 35c. per yd. The company intends to hydraulic the upper bench and to dredge the lower ground. Joseph Shebley, manager, with headquarters at Woodville, is constructing a ditch and flume to furnish water for hydraulicking under 200-lb. pressure, and intends to purchase the necessary pipe and apparatus to begin operations within two months. A sawmill is cutting lumber for the flume.

Woodville, September 30.

TEXAS

WEBB COUNTY

(Special Correspondence).—The Border Gas Co., a subsidiary concern of the Texas Producers Oil Co., of Houston, has a large force laying the pipe-line from its wells in the Reiser field to Laredo, a distance of 30 miles. Most of the pipe has been received. This company also plans to extend its line across the Rio Grande to Nuevo Laredo, Mexico. Both of these towns are industrial centres of importance, and are close to some of the largest zinc mines in Mexico, which makes the proposition of establishing a zinc smelter, in which natural gas shall be used for smelting, an attractive one. The situation is being investigated by practical smelter men with this object in view. The Reiser natural-gas discovery was made while boring for oil three years ago. The output of the gas is enormous, and all of the land around Reiser is under lease to oil companies which are exploring the region for oil. The Border Gas Co. will apply to the Mexican government for a concession to lay a pipe-line to Monterey, Mexico, a distance of 160 miles from this place. It also contemplates extending its system to San Antonio, 150 miles north of here. At Monterey there are a number of large manufacturing plants which would use gas for fuel. It is the chief industrial city of Mexico, having two large smelters, a ten-million-dollar steel and iron works, foundries, and various other manufacturing

plants of large size. Many pumping plants are situated along the Rio Grande above and below Laredo where the land is under irrigation. It is planned to furnish these plants also with natural gas for fuel.

Reiser, September 30.

UTAH

SEVIER COUNTY

(Special Correspondence.) The Sevier Miller Coalition Mines Co., whose mine and mill are situated fifteen miles from Sevier station and three miles west from the Annie Laurie mine, is mining and milling 40 tons per day of ore that averages $10 per ton. The ore consists of gold and silver-bearing quartz and the metals are extracted by cyanidation. The company contemplates installing a slime plant for cyaniding the slime after separating it from the sand. By such addition it is believed the percentage of extraction can be increased, although the mill work at present is fairly good. The mine is opened by adits driven from the side of the mountain. The ore occurs in veins, having a width of 20 ft. in some places. The mill, air compressor, and shop machinery are operated by electric power, generated at the company's hydro-electric plant on Clear creek, a tributary of the Sevier river. F. T. Tilden, manager for the company, is a heavy stockholder, as is also B. F. Bauer of the Salt Lake Hardware Company.

Sevier, October 1.

SUMMIT COUNTY

(Special Correspondence.)—The Silver King Coalition Co., for which George D. Blood is now general superintendent, has nearly 400 men on the payroll at the mine and mill, the major part of the force being employed on development. On the 1300-ft. level the 12-lb. rails have been supplanted by 20-lb. rails for electric haulage, and provision made for a trolley wire and a large ventilating pipe. An interesting feature of Silver King development consists of the Alliance adit, which starts in Empire canyon, running two miles westerly into what was formerly known as the Kearns-Keith group, but now included in the Silver King area. The laterals driven from this adit aggregate nearly two miles in length, and that part which connects the Alliance adit with the main Silver King workings corresponds to the 500-ft. level of the latter. This adit originally was driven to develop the Sampson ground and to provide drainage for the workings on the Kearns-Keith fissure, and within the last three years the latter have produced a considerable tonnage of profitable ore. An incline raise is being made on this fissure from the level of the Alliance adit to the old Kearns-Keith tunnel, a distance of 1000 ft., making a vertical height of 800 ft. The raise is progressing satisfactorily and thus far it has reached 250 ft. The laterals which go out from this adit serve to develop a number of fissures and beds at a good distance above the Silver King contact, as well as catching surface waters and keeping the Silver King workings dry. The Alliance adit flows 1200 gal. of water per minute, and the pumping plant at the portal, which delivers part of this volume to the concentrating mill, now has a Worthington, 4-stage, centrifugal pump, direct connected to an electric motor, General Electric make, the lift being 450 ft. Additional water for the mill work is conveyed from other parts of the property through surface pipe lines, two miles of which have been laid this year. All ore from the mine, including that taken from the fissures opened by the Alliance adit, is hoisted through the Silver King shaft. The electric haulage being established comprises the trackage on the 500 and 1300-ft. levels, the surface trackage leading to the waste dump, and that leading to the sampler and mill. The shop machinery will also be equipped for using electric power.

Park City, October 3.

WASHINGTON

CHELAN COUNTY

(Special Correspondence).—The Washington Steel & Iron Co., of Spokane, which has a large deposit of magnetic iron ore at Blewitt, is planning to erect a 20-ton smelter near the town of Leavenworth. E. H. Rothert, general manager, says the Rothert process will be installed.

Blewitt, September 23.

FERRY COUNTY

(Special Correspondence.)—John Lloyd, general manager of the Knob Hill mine, estimates $5,000,000 worth of ore available on the Lone Pine and Surprise mines in Republic district. The vein has widened to 25 ft. J. W. Twiner, president of the Trade Dollar Mining Co., says that shipments reach 5 cars per day. The value is said to range from $50 to $100 per ton.—Samples of ore from the Swamp King No. 2 Gold Mining Co.'s property at Orient yielded gold at the rate of $1347 and tellurium at $26 per ton, according to a certificate issued by W. H. Stowell of Spokane. The streak is 18 to 20 in. wide, equalling that of the Swamp King, according to advices received by Charles J. Johnson, the secretary, and was cut at a depth of 25 ft. in a vein that is wider than the shaft. A steam hoist and compressor may be installed. The company is headed by A. B. Railton of Spokane.

Republic, October 3.

STEVENS COUNTY

(Special Correspondence).—E. C. Regnier, of Boulder, Colorado, of the Blue Grouse Tungsten company at Loon Lake, has gone to the mine to select a site for a sampling plant to cost $10,000. A concentrator and other machinery for the Blue Grouse is also planned. Mr. Regnier announced in Spokane that he will open headquarters here in October and buy all the tungsten ore offered for sale by miners and prospectors in the district. He has already bought more than $1000 worth of ore mined in the Loon Lake region. A discovery of tungsten on the Jupiter claim, a mile east of Blue Grouse mountain, is reported. E. E. Alexander, of Spokane, who made the location, says there is a wide outcrop of granite through quartzite. The Tungsten King company has stored 5 tons of ore. The Blue Grouse company has 102 sacks of ore, running 30% tungsten, ready for shipment.

Spokane, October 1.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—The Slocan Star mine is again shipping to the Trail smelter after a prolonged shutdown, during litigation. An amicable arrangement has been reached and an initial shipment of 30 tons of silver-lead ore was sent out.——The Beatrice, one of the most important mines in the Lardeau district, is to be reopened, according to Harry Anderson, of Nelson, one of the stockholders. Over $50,000 has been spent in development and ore reserves have been blocked out. Shipments will be started and work carried on at the 450-ft. level to tap the orebody at that level and a raise driven to the upper level. The Revenue and Spider properties near the Beatrice will begin shipments of ore in a few weeks. The tunnel on the Weiss group is in 150 ft. and should cut one of the smaller veins in a few days. It will take nearly 350 ft. more to reach the main vein. The veins vary from 3 to 28 ft. in thickness and carry 60 to 75% lead and 8% silver, in the pay-streak.——A strong force is at work at the Standard mine, near Silverton. The mine is shipping regularly to the Trail smelter. Recently a 4-ft. deposit of silver-lead ore was opened. The vein on the intermediate level is 10 ft. wide and on the fifth level over 17 ft. in width and carries as high as 73% lead and 80 to 100 oz. silver.——An important strike is reported to have been made on the California group of claims, on Toad mountain. The vein has widened to 3 ft. and an average sample assayed $68.70. The mine has been developed to a depth of 225 ft. J. P. Bell is operating it under lease.— -At the Maestro, Ainsworth, the operator, Alexander Grant, has three feet of ore and 14 ft. of lode matter exposed. Shipments will be carried to the smelter as soon as the roads are in proper condition.—— The recent forest fires uncovered a new lead on the Society Girl claim, at Moyie, and the company has put 10 men at work developing it. All through the burnt districts prospectors are out over newly cleared ground and some

good finds are reported from Sheep creek and elsewhere. ——Several tons of ore per day from the Aurora mine, at Moyie, are being put through the experimental mill of the Consolidated company for test.——At the Mother Lode mine, Sheep creek, a new tunnel has been started on the second level to cut the vein in the old workings. The property is being developed by John McMartin, of New York, and there being no necessity for shipping ore it is not being done.——A new cross-cut has been started on the Clyde-Belt group, Sheep creek, which is under bond to the Britannia Mining & Smelting Co.——The French Complex-Ore Reduction Co., of Victoria, represented by A. Gordon French, will build an experimental zinc smelter at Nelson. The City of Nelson has leased to the company the old power plant as it will be necessary to generate direct-current for the work. Metallic zinc and zinc white will be produced, and the residue, containing silver and lead, will be sent to Trail for treatment.——Work is to be carried on at the Abestol mine, Poplar Creek district. Asbestos occurs in the seams and slips of the serpentine on this property for a distance of 1200 feet.

Rossland, October 1.

MEXICO

ZACATECAS

(Special Correspondence).—Mining activity in this district is slowly reviving. The Eden Mining Co. is remodeling and enlarging its concentrating plant and introducing Kobbe-Middleton grinding pans for re-crushing the middling and tailing from the Wilfley tables. The finer pulp will then be re-concentrated on Deister and Johnston tables after passing a Richards pulsator classifier. In the earlier stages of concentration Callow screens are to be used for sizing the pulp, prior to passing to different groups of Card and Wilfley tables. J. M. Nicol, of Mexico City, has been consulting engineer for the re-design and equipment of the plant. The custom milling and cyaniding plant which has been operating in the city of Zacatecas for some time past has not been as successful as was anticipated, partly due to the difficulty of successfully treating small lots of varying grades of ore and also to faulty design in the general arrangement of the plant. It is also stated that the San Luis del Oro mines may start work before long; this property is equipped with a 20-stamp mill and a small percolation plant, the latter one of the first to be built in Mexico. The mine has been idle for several years. It is situated to the south of Zacatecas in slate. Another interesting plant, now almost ready, is at the Laguna de Guadalupe, to the east of Zacatecas. The shore of the lagoon has been a catchment basin for several million tons of tailing, which have been washed down from the various old patios and other treatment plants which are scattered up the valley of the Zacatecas. The engineer in charge and who has been largely responsibe for the design of the plant, is Rodolfo Munoz. The plant has been designed to handle the tailing and also the ore from Las Minillas. The tailing will be collected by scrapers at loading stations and transported by tram lines to the plant, which consists of a Blake crusher, two Bryan mills with 40-mesh screen, one Dorr classifier, one Dorr thickener, four 15 by 45-ft. Pachuca tanks, arranged for continuous agitation; one cone receiver and distributer, which sends the leached slime to a Wilfley continuous-action drum-filter and the sand to a Grothe & Carter 75-ft. continuous-action tray filter, with the necessary auxiliaries, air-compressor, centrifugal pumps, and sand pumps. An attempt was made to leach the tailing directly, without re-grinding, but it was found to be too coarse and caused trouble in the Pachuca tanks, and it was found more economical and convenient to slime the whole. The tests on the Grothe & Carter filter showed a capacity, with this class of material, of over 100 tons per 24 hours. Tests have not yet been made on the Wilfley filter and when made, the results will be very interesting, as this is probably the only plant in Mexico in which filters of the drum and tray type are working side by side.

Zacatecas, September 30.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

C. W. MERRILL has gone to London.

LESLIE H. WEBB is in San Francisco.

LIONEL LINDSAY has gone to Mexico.

W. C. BASS is at Caliente, California.

GEORGE S. RICE was in San Francisco.

F. M. CARLOCK is now at Mercedes, Texas.

EDWARD W. CARSON is now at Los Angeles.

J. F. CALLBREATH, JR., is in San Francisco.

R. W. BROCK has gone to British Columbia.

EDGAR RICKARD and L. A. GREENE are at Chicago.

R. R. Belknap has gone to Marysville, California.

C. W. PURINGTON has left East Siberia for London.

J. A. HOLMES has gone to Siskiyou county, California.

H. W. HARDINGE has returned to New York from London.

RALPH ARNOLD was at Bakersfield and is in San Francisco this week.

L. A. SISLEY, of *The Mining World*, was in San Francisco this week.

CHARLES JANIN has returned from Zacatecas and the City of Mexico.

J. ATKINS has moved from Geneva, Colorado, to Glendale, Oregon.

COURTENAY BALLAGH is now with the El Tigre, at Yzabal, Sonora, Mexico.

L. H. DYKE has left Guayaquil, Ecuador, and is now at Gilroy, California.

DYKE V. KEEDY, of Dietz & Keedy, has returned to Boston from Nova Scotia.

O. ELLERMAN is at Douglas, Arizona, having left Deadwood, South Dakota.

HOWARD D. SMITH has gone to New York. He did not go to London as announced.

DESAIX B. MYERS will be in Philadelphia till October 15, when he returns to Los Angeles.

M. A. NEWMAN, of the Jesus Maria y Anexas, San José de Gracia, Mexico, is in San Francisco.

L. R. CLAPP has gone from New York to Cia. Real del Monte y Pachuca, Pachuca, Hidalgo, Mexico.

P. C. STOESS, who represents Pearse, Kingston & Browne at Seattle, is at Juneau, Alaska, for a short time.

E. R. BUCKLEY visited the Yosemite following the meeting of the American Mining Congress at Los Angeles.

C. B. KINGSTON has gone to Rhodesia, and GERALD M. BROWNE will sail from London for South Africa, October 4.

ARTHUR L. PEARSE, of Pearse, Kingston & Browne, New York and London, spent a few days in Salt Lake last week.

J. B. FLEMING having completed his work at Goldfield is now designing and constructing a stamp and cyanidation mill for the Nevada Hills M. Co., at Fairveiw, Nevada.

Members of the Mining and Metallurgical Society of America, under guidance of J. B. Lippincott, inspected the Jawbone, Elizabeth, and Saugus divisions of the Los Angeles aqueduct October 1 and 2. In the party were S. W. MUDD, J. W. MALCOLMSON, R. W. BROCK, H. F. BAIN, G. S. RICE, THEO. COMSTOCK, C. D. CLARK, S. B. CHRISTY, W. C. MENDENHALL, D. T. DAY, D. W. BRUNTON, and J. A. HOLMES.

F. L. RANSOM, E. W. PARKER, S. W. MUDD, J. W. MALCOLMSON, R. W. BROCK, H. F. BAIN, J. P. CHANNING, G. S. RICE, THEO. COMSTOCK, E. R. BUCKLEY, F. J. H. MERRILL, C. D. CLARK, S. B. CHRISTY, W. C. MENDENHALL, E. H. BENJAMIN, J. N. NEVIUS, D. W. BRUNTON, W. F. STAUNTON, C. C. JONES, T. R. WOODBRIDGE, L. W. POWELL, J. A. HOLMES, E. A. MONTGOMERY, SIDNEY NORMAN, E. W. BANNISTER, B. L. H. FORBES and E. HIGGINS attended a dinner of the Mining and Metallurgical Society of America at the Sierra Madre Club, Los Angeles, September 29.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

DECISION OF STATE COURT ON MINING NOT BINDING ON FEDERAL COURTS

The Supreme Court of the United States has recently held that a decision of a State court to the effect that a grantor in a deed conveying coal in place with the right to mine the same cannot maintain an action for damages for the failure of the grantee to properly support the surface of the land, is not binding on the Federal courts.

Kuhn *v.* Fairmont Coal Co., 30 Supreme Court Rep. 140, Jan. '10.

LOCATION OF MINE—RIGHT OF POSSESSION

The posting of a senior location notice on a mining claim which is based on a valid discovery gives the locators the right to such possession during the statutory period as would enable them to complete the location by performing the necessary work, and this right may be protected or enforced by proper action, but the location of a mining claim made upon ground covered at the time by prior valid subsisting location, is void.

Bergquist *v.* W. Virginia Wyoming Copper Co., (Wyo.) 106 Pac. 673, Feb. '10.

LIEN ON MINE CREATED BY CONTRACT

After persons jointly interested in mining property and for the development of which some of them had made large advances, then entered into a contract giving to the persons having made such advancements the right to manage the property and apply the profits, and in case of a sale the proceeds of the property was to be applied to the repayment of such advances. In an action on the contract involving the rights of the parties, it was held that the contract gave the persons making such advances an equitable lien on the property itself which they could enforce by foreclosure after it was found that the operation of the mine was unprofitable. And it was further determined that threats made by the parties having made such advances that they would make no further advances unless the other party signed such contract, and the mine would consequently be shut down and be rendered worthless, did not constitute such duress as would render the contract invalid.

Connolly *v.* Bouck, 174 Fed. 312.

OPTION TO PURCHASE LEASE—CONSTRUCTION AND EFFECT

A lessee of a mine who had power to assign the lease with the consent of the lessor, gave a third person three different options for the purchase of the lease. At the same time the proposed purchaser delivered a written agreement to the lessee by which he bound himself to accept one of the three propositions, and until such acceptance he agreed to pay the expenses of the operation of the mine by the lessee. Thereupon the lessee accepted the proposition and began working the mine, but on failure of the proposed purchaser to pay the expenses of such operations stopped the work and under the terms of the lease the lessor forfeited the same. In an action by the lessee against the proposed purchaser it was held that the lessee could not recover a monthly rent stipulated in one of the option agreements, as the time not having expired in which to accept the proposition, the proposed purchaser might have accepted another one of the option agreements which did not require the payment of a rental. It was also held that he could not recover the purchase price agreed to be paid for the lease and certain machinery because the lease was forfeited before the expiration of the purchaser's option to accept the proposition, and therefore the lessee had nothing to convey. But it was held that a cause of action existed against such purchaser for the expenses agreed to be paid by him to the lessee for working the mine, as by non-payment the lease was forfeited to the lessees.

Hummer *v.* McGee, (Wis.) 124 Northwest. 302, Jan. '10.

Book Reviews

Any of the books noticed in this column are for sale by or can be procured from the MINING AND SCIENTIFIC PRESS.

CONTRACTS AND ENGINEERING. By James Irwin Tucker. Pp. 307. Index. $3.50. McGraw-Hill Book Co., 239 W. 39th street, New York.

This work is particularly intended as a guide to contracting engineers in preparing contracts with a view to legal requirements. The preparation of specifications which will stand the test of the courts is an important matter, as many contractors have learned to their sorrow, therefore properly worded contracts are a necessity.

CHEMISTS POCKET MANUAL. By Richard K. Mead. Second Edition. Pp. 444, pocket size, Ill., flexible back. Chemical Pub. Co., Easton, Pa., 1910. Price $3.

The new edition of this well known and much used hand book, includes a large amount of new and valuable matter. The old text has also been re-written and rearranged. The book is standard and does for chemists and chemical engineers what the manuals of Trautwine, Kent, and Supplee do in other fields.

COMPRESSED AIR, THEORY AND COMPUTATIONS. By Elmo G. Harris. Pp. 123. McGraw-Hill Book Co., New York, 1910. Price, $1.50.

In the preface, the author clearly states the nature of the treatise, and says that no one should be entrusted with the designing of compressed air plants who is not fully qualified by education and experience to undertake so responsible a task. The work is mathematical and contains much information of value to those employing compressed air or who contemplate installations of that character. It deals with the use of air under varied conditions, as affected by attitude and otherwise, and chapters are devoted to special applications of compressed air; the return-air system, and air-lift pump.

PRINCIPLES OF METALLURGY, being an introduction to the metallurgy of the metals. By Charles Herman Fulton. Pp. 528, index., Ill. McGraw-Hill Book Co., New York, 1910. Price $5.

In this volume the author, the professor of metallurgy at the South Dakota School of Mines, has endeavored to supply a treatise of introductory character, to the study of metallurgy, and he has succeeded admirably. One of the most important chapters in the book is that on slags, which are treated at length; another interesting and important chapter is that on refractory materials for furnaces or furnace linings. The section of the various types of furnaces is also of value, as it is well illustrated with drawings which give dimensions and unusually full details of construction. In short, it is a work which will be equally welcomed by the student and by the experienced metallurgist.

PRACTICAL DATA FOR THE CYANIDE PLANT. By Herbert A. Megraw. Pp. 92, pocket size, Ill., flexible cover. McGraw-Hill Book Co., New York, 1910. Price $2.

This book is, as frankly stated by the author, a compilation designed to give shift-bosses some insight as to the reasons for the various steps involved in cyanidation, and tables needed in daily calculations. Following a brief introduction, are mensuration and conversion tables that in the main are well chosen and likely to be extremely useful. It would have been well to have included such a table as that of W. A. Caldecott by which the slime-pulp capacity of circular vats may be determined directly. Another table that will be missed is one giving pounds or ounces of KCN necessary for any given number of tons of solution of various strengths. It saves calculations and mistakes to have such details figured and checked once for all. However, these and other features will doubtless be added to future editions as demand for them arises. In the meantime, Mr. Megraw has performed a real service in bringing together as much as appears in this book.

Market Reports

LOCAL METAL PRICES.

San Francisco, October 6.

Antimony	12—12¾c	Quicksilver (flask)	46
Electrolytic Copper	14½—15¾c	Spelter	7—7¾c
Pig Lead	4.70—5.65c	Tin	37½—39c

METAL PRICES.

By wire from New York.
Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Sept. 29	12.30	4.40	5.54	53⅞
" 30	12.30	4.40	5.54	
Oct. 1	12.30	4.40	5 54	54⅛
" 2	Sunday.	No market.		
" 3	12.33	4.40	5.54	53⅞
" 4	12.38	4.40	5.54	53¾
" 5	12.45	4.40	5.54	53⅞

ANGLO-AMERICAN SHARES.

Cabled from London.

	Sept. 28. £ s. d.	Oct. 6. £ s. d.
Camp Bird	1 12 0	1 11 9
El Oro	1 7 3	1 7 6
Esperanza	2 11 3	2 8 1½
Dolores	1 5 0	1 5 0
Oroville Dredging	0 7 0	0 7 0
Mexico Mines	7 17 6	7 17 6
Tomboy	0 16 3	0 16 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Oct 6.		Closing prices, Oct. 6.
Adventure	$ 7	Mohawk	$ 49
Allouez	44	North Butte	30⅞
Atlantic	6	Old Dominion	39¼
Calumet & Arizona	58¾	Osceola	127
Calumet & Hecla	550	Parrot	12
Centennial	19¼	Santa Fe	1¾
Copper Range	67½	Shannon	10
Daly West	9	Superior & Pittsburg	12¾
Franklin	11½	Tamarack	
Granby	25	Trinity	5¼
Greene-Cananea, ctf	6¾	Utah Con	23¼
Isle-Royale	23	Victoria	2½
La Salle	10½	Winona	8⅝
Mass Copper	8¾	Wolverine	125

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Oct. 6.		Closing prices, Oct. 6.
Amalgamated Copper	$ 64¾	Miami Copper	$ 19⅜
A. S. & R. Co	68¾	Mines Co. of America	9/16
Braden Copper	3¾	Montgomery-Shoshone	⅛
B. C. Copper Co	7⅛	Nevada Con	20
Butte Coalition	18⅞	Nevada Utah	1
Chino	20¼	Nipissing	10⅝
Davis Daly	2	Ohio Copper	1⅝
Dolores	5½	Ray Central	1¾
El Rayo	3⅝	Ray Con	18⅞
Ely Central	¼	South Utah	1⅞
First National	3⅞	Superior & Pittsburg	12⅝
Giroux	7	Tenn. Copper	34½
Guanajuato Con	¾	Trinity	6
Inspiration	8¼	Tuolumne Copper	3⅜
Kerr Lake	6⅝	United Copper	4½
La Rose	3⅞	Utah Copper	49⅜
Mason Valley	8⅛	Yukon Gold	3⅞

SOUTHERN NEVADA STOCKS.

San Francisco, October 6.

Atlanta	$ 12	Mayflower	$ 5
Belmont	3.75	Midway	20
Booth	11	Montana Tonopah	95
Columbia Mtn	5	Nevada Hills	2.35
Combination Fraction	35	Pittsburg Silver Peak	49
Daisy	3	Rawhide Coalition	7
Fairview Eagle	40	Rawhide Queen	
Florence	2.10	Round Mountain	45
Goldfield Con	7.80	Sandstorm	4
Gold Kewenas	8	Silver Pick	7
Great Bend	3	St. Ives	20
Jim Butler	29	Tonopah Extension	1.07
Jumbo Extension	29	Tonopah of Nevada	8.75
MacNamara	29	West End	51

(By courtesy of San Francisco Stock Exchange.)

SEPTEMBER COPPER REVIEW

By M. E. Appelbaum

During the month of September copper sold as high at 12¾c. delivered 30 days and closed at the low figure of 12½c. delivered 30 days. Transactions were not of a very large nature excepting for steady purchases made by the European buyers where business seems to be exceedingly good. The only feature of interest during the month of September was the publication of the Producers' report on September 8 covering the August output and deliveries resulting in a small decrease in the visible supply. The record production was due to the action of the New York refineries in pushing the production in August, thus making up for the decreased production in July on account of labor troubles and weather interference. The statistics, however, to be published for the month of October, should for the first time show the real curtailment of about 15%, and if Europe and this country continue to consume copper at the present rate, we should, by the end of the year, have a considerable reduction in the visible supply. Several new mines will begin production around the beginning of the year and it will therefore be necessary to continue the curtailment policy in order not to increase the visible supply and furthermore keep the price of metal at a sufficiently low figure so as to permit liberal purchases. Considering, however, that 12½c. copper compared with the present cost of production is equivalent to at least 14c. copper compared with the cost of a few years ago, one cannot help feeling that the metal has given a good account of itself in the face of the exceedingly large surplus, and that with a year or two of real good business the surplus will become normal and higher prices may then be looked forward to.

COMMERCIAL PARAGRAPHS

The name of the firm formerly known as the Standard Engineering Co., of 503 Market street, San Francisco, has been changed so as to incorporate the names of the members, and in the future will be known as Braun, Williams & Russell, Inc. The same line of business will be continued.

The Goldschmidt Thermit Co., of 90 West street, New York, announces that commencing October 1, E. Stutz, vice-president and general manager, retires, William C. Cuntz becoming manager. Mr. Cuntz brings to his position a thorough knowledge of the steel business and a wide acquaintance with the railway and street railway officials of the country, having been connected for eighteen years with the Pennsylvania Steel Company.

The Mine Management Co. has been formed by the association of Henry M. Adkinson, Stuart Croasdale, and R. D. George, to undertake examination and management of mining properties of all sorts. Offices have been opened at 714 Equitable building, Denver, Colorado, and Mr. Adkinson will act as manager. The new company announces that its services are to be strictly professional. It will not be interested in or concerned with the promotion of mines, the sale of shares, or the sale of machinery or supplies.

DIVIDENDS

On Tuesday, October 4, the Bunker Hill & Sullivan M. & C. Co. paid dividend No. 157 of .$98,100. This makes the amount of dividends paid since January 1, 1910, $843,600 and the total to date $12,129,600.

Spelter is firm at 5.45 in spite of rather indifferent demand, because the signs of a serious curtailment in production owing to gas shortage in a number of Kansas plants are multiplying. A number of plants around Iola which are still running a block or two will have to shut down during the winter, never to be operated again, for the gas on which they depended for fuel has been exhausted or the price has advanced so much, that the use for zinc smelting is impossible. A number of other plants are operating with oil in order to husband their gas supply.

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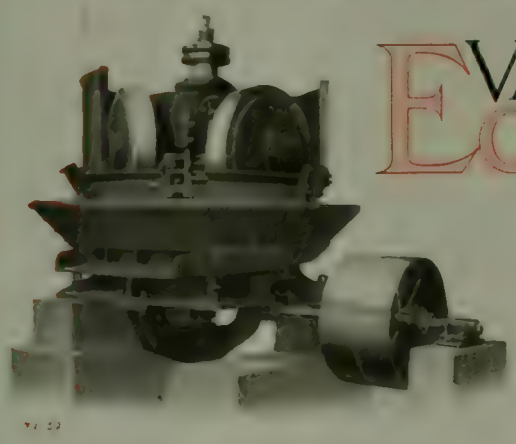
INDEX TO ADVERTISERS, PAGE 46. PROFESSIONAL DIRECTORY, 6-26. BUYERS' DIRECTORY, PAGE 44.

Power & Mining Machinery Co.

CUDAHY, (Nr. Milwaukee) WIS., U.S.A.

District Offices: New York, Chicago, Atlanta, El Paso, San Francisco



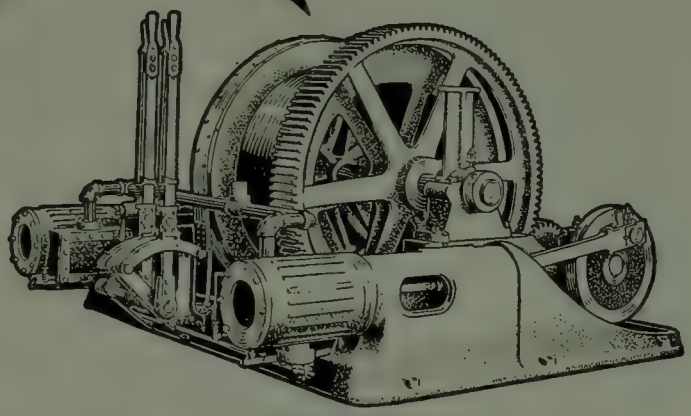
EVANS WADDELL CHILIAN MILL

The Roller Shafts are integral with the central spider, which is loosely mounted upon a ball that slides on the main spindle. Any vertical movement of a roller is automatically taken care of by a slight cocking of the spider on the ball. By this construction hinged shafts are eliminated and the effective crushing weight increased twenty-five per cent.

Other notable improvements in design include mortar cast in one piece and a launder for collecting the pulp cast integral with mortar. Roller rings and die of rolled steel. Pinion of cast steel and gear of semi-steel or steel. Bulletin No. 29 gives full particulars. Write for it.

YOU WANT THE BEST

AND HERE IT IS



VULCAN STEAM HOIST

IMMEDIATE DELIVERY HOUSE H&B DENVER

CATALOG?

THE HENDRIE & BOLTHOFF
MANUFACTURING AND SUPPLY COMPANY
DENVER, U. S. A., COLO.

MINING AND SCIENTIFIC PRESS

"Science has no enemy save the ignorant."

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EDITORIAL

THE importation of a large tonnage of pig iron and iron ore from China by the Western Steel Corporation, of Seattle, Washington, is food for thought on the part of those interested in the iron ore deposits of the West.

THUS FAR nothing definite is known of the perpetrators of the dynamite outrages at Los Angeles on October 1, although the police, according to the daily press, is 'hot on the trail' of the criminals. Every right-thinking person sincerely hopes they will be apprehended and punished as their crime deserves.

OUR comment on the Southern Pacific oil lands in last week's issue was founded, as it develops, on a misapprehension as to the exception in these particular patents. This is but the old clause that has been frequently placed in such patents and which has been held by the courts to be void for reasons already suggested.

AS a notable instance of how low mining costs may be reduced when the situation and general conditions are favorable is the fact that the Alaska United Gold Mining Company was enabled to make a handsome profit on its operations for the month ended August 15, on an ore from its Ready Bullion mine yielding but $2.01 per ton. There was crushed 21,140 tons, at an operating expense for mining and milling of but $26,023.83, being $1.23 per ton.

A RECENT decision of the Canadian Railway Commission against the White Pass & Yukon Railway Company in the case of Mr. J. H. Conrad, who claimed the company was guilty of charging extortionate rates for handling ore and mining machinery, is illuminating and should be gratifying to the mining men of the Far North. The railway company had charged Mr. Conrad a rate of $3.75 per ton whereas the Atlas company paid but $2.50 under a secret agreement.

THE GOLD output of the Transvaal continues to increase, as shown by the official figures of the Chamber of Mines for July 1910. Nearly every month for the first half of 1910 shows an increase over the figures for the corresponding period of 1909. The total output from January 1, 1910, to July 31, 1910, was £18,269,244, as compared with £18,084,512 for the first half of 1909. During the period covered by the report, 9806 stamps were dropping and 166 tube-mills were in operation. The amount of ore crushed was 12,576,402 tons, a duty of 6.97 tons per stamp per each 24 hours.

THEORIES as to the distribution of ore near the outcrop of veins occurring near Fairbanks, Alaska, as expressed in a letter from our correspondent at that place, and found elsewhere herein, are of an interesting sort. Whether the facts justify the local conclusions or not we are unable to say at this time. That the frost-line should have any influence on the width of a vein seems strange, and in all probability is merely a coincidence.

AGAIN press despatches bring the news of disastrous forest fires in the middle northern States, and extending into Canada, with the loss of hundreds of lives and the destruction of millions of dollars worth of property. Entire towns have been swept away in northern Wisconsin and the inhabitants either burned or rendered homeless and absolutely destitute. Without doubt this great generous country will not wait for a call for aid from the sufferers but will send food and clothing to the needy.

PRESENT mining activity in Sierra county, California, furnishes an example of the fluctuations of fortune in mining regions. In early days there was no more wide awake and energetic district in the West than existed about Alleghany in Sierra county. The great Sierra Buttes, Young America, and numerous other mines were in operation, and Sierra was prosperous. Then came a long period of quiet, almost idleness, until several rich discoveries were made—and these are what count in stimulating interest—and Sierra county is once more 'in her element' with 'something doing,' every day, and splendid outlook for the future.

CONSTRUCTIVE criticism is always helpful. In this issue we publish a description of a new agitator designed for cyanide work, by Mr. Lee Fraser, in Costa Rica. In out of the way corners of the earth it is not easy for engineers to discuss matters with their fellow workers and in submitting this design Mr. Fraser states frankly that the agitator has not been altogether successful when tested on a working scale. He is hopeful that some other engineer may be able to suggest points that the designer himself has overlooked. Admission of mistakes is not easy to make, and the spirit in which Mr. Fraser has acted will, we are sure, elicit, as it deserves, the helpful criticism of other workers.

CHINA continues to be the centre of interest in the Far East. Beset with difficulties from without and unrest within, the problems of administration have become peculiarly difficult. Between the young men who would make the country over in a day, and the conservatives who dread any change whatever, there is the same struggle as between 'Insurgents' and 'Standpatters' in America. Indeed the analogies to our own country are more intimate than is often recognized. The Viceroys and the Provincial governments are in many things as independent as are our Governors and State governments. The Chinese administration in effect is dual as is our own, and re-establishment of the central authority is a difficult and delicate process. In the meantime, most fortunately, the industrial situation continues to improve, and progress in education is rapid. There can be nothing but good in feeding people well and teaching them to think straight. New railways, new mines, new schools, and visits to foreign countries, are all preparing China for playing a large part in the world's affairs. Americans can well afford to welcome all these evidences of progress though the project, much discussed in the Far East, for an actual alliance between the Empire and the Republic, is too foreign to our policy to meet much favor.

THE reported discovery of large masses of carbonate and silicate of zinc in the mines of Leadville is almost startling. It seems strange that the existence of these minerals had not been observed long since, but such oversights are not without parallel—instance the years from 1860 to 1875 during which lead carbonate was rejected, tons of it, by the placer miners of Oro City (Leadville) when found in their sluice boxes. There seemed some excuse for the failure to recognize the carbonate sand in those days, but it is difficult to find similar excuse for the miners of the present day at Leadville. If statements concerning this discovery are not exaggerated Leadville will become a much more important producer of zinc ore within a short time, than ever before.

The Utility of Conveyors

Conveying machinery is reaching an advanced stage of development, particularly for the purpose of handling minerals. A few years ago about the only automatic conveyors to be seen about mines were in the mills where spiral conveyors were utilized to move ore from the front of the dry-crushing battery to the pit beneath the roasting furnace, from which it was lifted by a bucket conveyor to the hopper above the furnace. Now, conveying machinery is seen in mines, mills, and smelters, in railway yards, and almost everywhere that materials and merchandise are to be moved comparatively short distances. Belt conveyors are used to carry coarse rock from the collar of the mine shaft to the rock-breaker; from the storage bins to bins back of the pulverizing machinery; elevating crushed ore from one level to another; from the stamps or rolls to cyanide vats; and tailing is elevated to the top of high and constantly increasing piles of débris. Everywhere that economy of handling is sought finds conveying machinery at work. Conveyors have greatly simplified the planning of large metallurgical plants. Ordinarily well designed mills are so arranged that the ore, after reaching the top of the mill, passes by gravity through the successive operations of crushing, grinding, and metallurgical treatment, the tailing being discharged at the lowest level of the mill. In very large plants, however, this simple application of gravity is impossible without having a hillside slope 200 to 300 feet in height available, and in such cases the buildings would cover many acres. By the introduction of the various types of conveying machinery the engineer is enabled to plan to handle the ore within relatively limited floor space,

the ore going from one operation to another on belts horizontally or up grades of twenty degrees or more or vertically by link belt buckets. The ore is handled dry or wet, hot or cold, coarse or fine. It may be sent in any desired direction and discharged automatically just where it is wanted and may even be weighed where this is desirable and it usually is, though often neglected. In fact, the modern conveyor has been successfully introduced, in one form or another, to meet almost every condition that arises in the handling of ore about metallurgical plants.

Ratio of Value to Depth

The increase, or decrease, of value of ore with greater depth is a subject of practical importance, and one in which every miner, whether working at the face or directing affairs from the office, takes personal interest, and the remarks of Mr. F. Lynwood Garrison in this connection in the department devoted to Discussion will attract the attention of engineers and geologists alike. It has generally been observed that the value of ore decreases with depth in veins, but this depth is relative. A mine may have been profitable—even rich—for the first thousand feet from the surface and then have become gradually, or perhaps suddenly, poorer, thus rendering a paying proposition unprofitable, and the search for better ore at still greater depth has been discontinued and the mine abandoned. It is possible, however, that at greater depth the ore may have been found to become richer. If the exploration is not undertaken it cannot positively be known whether such is the case or not. In the Cripple Creek district of Colorado, for instance, very rich ore is being mined at depths below 1500 feet. Not in as large quantity, perhaps, as was found in higher levels, but of as great value. The Kennedy mine, near Jackson, on the Mother Lode of California, is not only profitable at a vertical depth of 3300 feet, but has produced phenomenally rich ore at 3150 feet vertically beneath the surface, which is equivalent to a depth of over 4000 feet on the vein, and this, after passing through a relatively poorer zone, for several hundred feet above. At the Central Eureka mine, about two miles north of the Kennedy, no payable ore of consequence was found within 1000 feet of the surface, though there were large and profitable orebodies developed below that point. Some of the mines of Grass Valley produce some extremely rich ore nearly 4000 feet below the outcrop, which may be considered as an index of what is possible in that district. Much knowledge of the origin, character, and probabilities of ore deposits has been gained within recent years, particularly since the first appearance of Franz Posepny's monograph on the 'Genesis of Ore Deposits,' and deeper mining stimulated by the occurrence of rich ore at great depth in even a poor mine may result in finding that these occurrences are not isolated and unusual. In the development of the deepest mines of the West it has been observed that there are, in some of them, zones of poorer ore as well as richer, and that the best deposits are not always nearest the surface.

Mining in Western Australia

The mining industry in Western Australia as indicated by the report of the Department of Mines for 1909, shows a continued reduction in the output of gold from that of 1908, in which year it was less than in 1907. This, too, notwithstanding that the tonnage of ore treated was greater in 1909 than in 1908. The cause lies in the treatment of ore of somewhat lower grade than in previous years. Concerning the outlook for the gold mining industry, the under secretary of mines says that although practically no outside capital to assist mining operations has been introduced the past few years, yet the outlook is favorable. A number of large orebodies have been recently found and their development proceeds with satisfactory results. The value of the ore is well maintained with increasing depth, and an even more prosperous era than the industry has yet experienced there, is dawning. This is assuredly an optimistic view to take of the situation. One cause of the noticeable lack of energy in new development is attributed to unusual activity in the settlement of new agricultural lands, which has detracted from the ordinary interest in mining. Every effort is made by the government in Australia to foster and encourage the mining industry by loans of equipment and means of transportation, a paternal sort of government procedure to which many object in the United States. There still remains a large field for prospecting in both the old and new districts of Western Australia.

One More Expensive Lesson

Another fatal explosion has occurred in a coal mine in southern Colorado, near Trinidad, in which a large number of men lost their lives on October 9. The cause of the explosion is said to have been due to accumulation of dust in the workings, as it was not generally considered a gassy mine, and safety lamps were not in use, nor was blasting necessary. The usual acts of heroism on the part of those attempting the rescue of imprisoned men, and the scenes of distress at the mouth of the mine were witnessed. After ineffectual attempts to penetrate into the workings an electrically operated fan was placed on a flat-car and advanced into the mine as fast as it was safe to proceed. This is a novel manner of approaching the locality of an explosion in a coal mine, which in this instance occurred several thousand feet from the entrance. Unfortunately the men operating the relief car were unable to proceed far owing to the presence of a large volume of blackdamp which all but suffocated them.

This is but another lesson teaching the necessity of the most rigid investigation of conditions in coal mines, and to bring about which the Bureau of Mines will make strenuous effort. While statistics indicate that the percentage of loss of life annually is fully as large in metal as in coal mines, disaster in the latter usually are accompanied by the loss of life in such numbers as to shock all humanity.

A Geological Journey in Guerrero

By John Wellington Finch

I undertake with some misgiving the following account of a trip of observation in the State of Guerrero, Mexico, because a great amount of territory was covered in a very brief time and a hasty inspection made of some great ore deposits which, if given justice, would have required weeks instead of days. Nevertheless, the Reforma mine, which was in fact the goal of the expedition, possesses features of such interest that I shall attempt a description just as it impressed me, principally because it forms a basis for the theoretical discussion of the genesis of an important and by no means uncommon type of sulphide-ore deposit. I shall be obliged to make free use of data furnished by others, especially by the officers of the Reforma Mining & Milling Co., and by engineers who have made detailed examinations of its orebodies, in order to lend substantiality to conclusions which my own hasty observations suggested. If I fall into error in any particular, I hope even the error may accomplish good by inducing some of the several eminent engineers who have, I know, studied the mine thoroughly, to exercise their altogether too reluctant pens to set the matter straight. Although the Reforma appears to be a really important group of ore deposits commercially, especially in their potentialities for the future, I do not consider myself at liberty to discuss the property from this point of view. This paper will therefore be strictly geological.

Routes of Travel.—From Balsas, the southern terminus of the Cuernavaca branch of the Mexican Central railway, a barge conveyed our party down the Rio Balsas 40 or 50 miles to Pezoapan, the river station of the Reforma company, and situated at the mouth of a tributary canyon, overlooking the head of which, nine miles north, is the village of Campo Morado and the mines. The trip from Pezoapan to the mines was made on horseback over the ridges and mountain crests because of high water in the stream along the canyon trail. The return trip from the mine to the town of Balsas was by saddle across country over the series of high parallel ridges of the mountain range. This journey was continued over two days. The riding time from village to village at good speed was as follows: Campo Morado to Liberaltepec, 3½ hours; thence to Tlanipatlan, 1½ hours; thence to Apaxtla, a miserably filthy Indian village where we unwisely stopped for the night, 2½ hours; then 2½ hours to Tlalsala, 3 hours to Limontitlan, and 2 hours to Balsas.

Location and Topography.—Campo Morado lies, I should estimate, fifty miles in a straight line somewhat north of west of Balsas. Its altitude is about 4200 ft. above the sea, and 3000 ft. above the Balsas river. The deepest level on the principal Reforma vein is 1000 ft. above the main tributary canyon which passes within a mile of the mine. The topographic relief is extreme. If the prevailing rocks were granite, the topography would be rugged, but being comparatively soft shales and shaly limestones, the mountain profiles are smooth and well mantled with vegetation, though steep. Notwithstanding the vegetation, erosion is intense. Trails are difficult to maintain, and reservoirs for power and other purposes silt up rapidly. From June to November rainfall is abundant. In the dry season the surface becomes thoroughly desiccated. The Balsas is a great river, comparable in volume to the Colorado or Snake. It is named from the balsa or barge, which is a strong, heavy, and deep flat-bottomed vessel that has been peculiar to this stream for many generations, and by which the native commerce is floated down, and laboriously pulled up stream by bands of Indians tandem on tow-ropes. The current of the river is swift, and it is eroding its canyon rapidly. The range through which it passes from Balsas to the coast has apparently been recently uplifted several hundred feet. At the time of this visit, though the rainy season had just begun around the sources of the river and there had been only one heavy rain at Campo Morado, yet the water was as thick with silt as pulp in a Pachuca agitator. When running the rapids, pebbles could be heard rapping the bottom of the barge like hailstones on the roof of a house. There is an average of about two rapids to the mile, and they run at the rate of 10 to 15 miles an hour. They appear at curves of the river where it breaks across the tilted shale and limestone strata. The calmer and broader reaches of the river follow along the strike of the softer beds. The river has, therefore, a meandering course.

Geology Between Balsas and Campo Morado.—For the entire 40 or 50 miles the slopes and walls of the Balsas canyon exhibited folded and faulted shales and thin-bedded shaly limestones, both usually dark colored and evidently carbonaceous. They are generally steeply dipping and appear to be recurring strata of the same system. Their prevailing dip to the southwest suggested that these beds were in the western limb of a huge anticline, the eastern segment of which may lie somewhere east of Balsas. No reliable estimate could be formed of the thickness of the beds, but it is certain that we passed at least a mile of strata at one part of the river journey, standing nearly vertical and apparently without repetition of beds. It is a region of extraordinary crustal shortening which must have involved rock readjustment to profound depth. Occasionally an intrusive body was seen, usually as an intercalated sheet, or thick sill, coarsely crystalline in texture, and, judging from color and weathering effects, probably belonging to the silicious group. The shattering, faulting, and folding of the intruded bodies, as observed in several cases, proved that a great deal of the structural deformation has been subsequent to their injection through the beds, also the fact that they are usually sills, instead of dikes, suggests that the beds were not greatly fissured before, or at the time of, intrusion. Small areas of effusive porphyry were passed on the return trip.

Near Apaxtla there were evidently several eruptions judging from the varieties of rock. The porphyry areas are much eroded but this does not signify great age, because the rate of erosion has been rapid. The porphyries observed appeared on the lower mountain slopes and in the valley bottoms but were not seen near the summits of the great ridges which we crossed. It is a reasonable supposition that the topography had become established essentially in its present outlines before these eruptions.

Geologic History of Campo Morado.—In its general features, Campo Morado does not differ materially from the other regions traversed between it and the village of Balsas. There is a closer grouping and greater individual thickness of the intrusive porphyry was seen at several points, probably all exposures of the same large dike. At the Naranjo mine of the Reforma group there was some evidence that an unmetamorphosed porphyry overlay the older sill which adjoins the orebody there. The effusive areas east, toward Balsas, are clearly more recent that the granodiorite. Altogether there seemed to be sufficient evidence of two or more volcanic epochs, and that, at some time subsequent to the solidification of the granodiorite, there were instituted the apparently long-continued thermal conditions which accomplished most of the metamorphism, and which were responsible for the extensive sulphide deposits. Although it is entirely speculative, it is reasonable to assume that the dynamo-metamorphism of the grano-diorites was accomplished in the mountain-building period of Tertiary uplift, and that the more recent dikes and ejectamenta of the region are late Tertiary.

Reforma Mine, Campo Morado, Mexico.

bodies. There are also more notable effects of orogenic disturbance. As I recall the stratigraphic history of this part of Mexico, the sedimentary beds are probably Lower Cretaceous (Comanchean). The large intrusive masses may be named provisionally granodiorite. They seem to be particularly thick at the mines and to thin out each way from it on their strike. This, together with the special exhibition of thermo-metamorphism in the adjacent beds here may indicate that the district is near the source of the magmas. The intrusive bodies strike with the beds about N.60° W., in regular form, but they have great variations of dip, as do the beds. They have been sheared throughout to such an extent that they present a schistose appearance, and they have had much mineral matter added to them and substituted in them. In fact, they seem to have suffered nearly as much metamorphism as the adjacent sediments. I was naturally led to seek a cause of metamorphism later than the bodies themselves.

On the high trail from the river to the mine, a coarse-grained fresh porphyry (possibly monzonite-

The Orebodies.—The sulphide ore consists of practically solid masses of pyrite with small amounts of chalcopyrite, sphalerite, and galena filling fissures and replacing the beds, usually along contacts with the bodies of granodiorite. They resemble the Rio Tinto deposits in form and relations to contacts, but the ore in composition is more like the Mt. Lyell pyrite bodies, of Tasmania. The Reforma body has an average width, in six levels, of about 100 ft. and has been shown to be continuous through the mountain. The sixth level develops the pyrite about 2000 ft. on the strike between the oxidized zones at each end of the level. The Naranjo body lies south of the Reforma and approximately parallel. This body seems to be an almost total replacement of a large elongated body of slate surrounded by intrusive rocks. The slate structure is preserved in the pyrite in places and approximately in the middle of the body a small remnant of slate remains unreplaced.

The Mamey body, recently opened, is developed chiefly in the oxidized zone. It lies north of the Reforma. It was not apparent, from the attention which I gave it, whether it had any relation to a dike contact. It was my impression that it was an isolated replacement deposit formed through a fissure in the slates. All the orebodies dip toward the southwest. Other similar parallel bodies are said to be in process of development at a number of points near Campo Morado to the southwest on other properties which were not visited. The following discussion, though it applies in most particulars to the other lodes at Campo Morado, will refer especially to the more completely developed Reforma body.

Theory of Genesis of the Pyrite.—During the uplift period the Reforma sill of granodiorite was tilted and folded with the beds. Incident to this was the development of fissuring and fracturing along its contacts in the less resistent sediments. In the subsequent period of thermal activity the sediments, being highly carbonaceous were ideal precipitants and, being crushed and shattered, their lime, silica, and alumina were prepared for rapid solution and sulphide substitution. The extent of the fissuring must be largely inferred. Evidences of it do not show clearly in the foot-wall beds. The fractured material has been thoroughly healed by metallic deposits. The walls of the ore, though curving locally, are yet quite regular and the vein has such uniformity of width as to suggest a replaced, broad, fissured zone, and not an irregular extension by replacement into the slates from a narrow fissure; such, for instance, as in the Coeur d'Alene lead deposits. The unreplaced diorite in the hanging wall shows best evidences of the extent of fissuring. Adjoining the ore there is a broad zone of brecciation in the diorite cemented by silica and other nonmetallic minerals. The great duration of the period of stress is suggested by the sheared or schistose condition of the granodiorite. Granodiorite of this texture is brecciated adjoining the lode, showing that the state of stress which culminated in fissuring occurred long subsequent to the intrusion of this body. Before metallization began, the fissure was probably a broad fracture zone not less than 150 ft. wide, 100 ft. of this being largely fault clay and fragments of slate, which was later replaced by ore, and 50 ft. of less shattered granodiorite, which was not so susceptible to replacement and was merely cemented. The granodiorite did not supply the thermal conditions which created the metallic deposits, but merely transformed the shales into slates for a certain distance from contacts. Without going into greater detail, there is reason to believe that the main metallization was effected during modern volcanic epochs, and that the older granodiorite bodies merely served as hard layers along which strain might become concentrated, forming fissures of great length and probably to profound depth. The sheared and shistose diorite contains a notable amount of disseminated sulphides. Megascopically no evidence was seen that any of these disseminated minerals were primary constituents of the rock, but a good part of them were clearly subsequent filling of fractures or lines of shearing. The longitudinal-section sketch illustrates in a general way, as now developed, the relations of the deposit to the topography, and the division into oxidized and sulphide ores. The sulphide ore is dense and fine grained, and in many places the grayish-white pyrite groundmass shows little or no visible crystallization, the other sulphides standing out like phenocrysts in porphyry. To the eye the pyrite mass shows almost no variation from point to point on strike or dip. On the deepest level it has a uniform mineralogical appearance from the oxidized ore on one side of the mountain to that on the other side. Assays, however, indicate a grouping of certain of the metals. The best copper, gold, and silver value lies along the foot-wall, where there is a comparatively regular band averaging at least 20 ft. in width. This band is clearly defined on assay plans and contains an average assay in gold, silver, and copper from two to three times that in the middle of the vein. On the hanging wall side, the assays are a little higher in many places, but there is not a continuous band or shoot. At the west end of the sixth level, the higher grade ore extends across the entire width of the lode, about 125 ft. The following table shows the variations of the metals, each assay representing the entire width of the vein. The gold seems to vary somewhat with the zinc and the silver with the lead. The figures do not represent values, but only numerical variations.

Cu.	Zn.	Au.	Pb.	Ag.
23	51	14	29	89
14	37	5	15	23
17	48	11	21	85
6	13	6	3	25
7	33	10	20	60
13	41	12	17	94
7	18	3	4	13
13	20	5	12	28
7	23	6	12	34
6	16	4	3	21
5	21	26	35	98
7	38	1	17	25

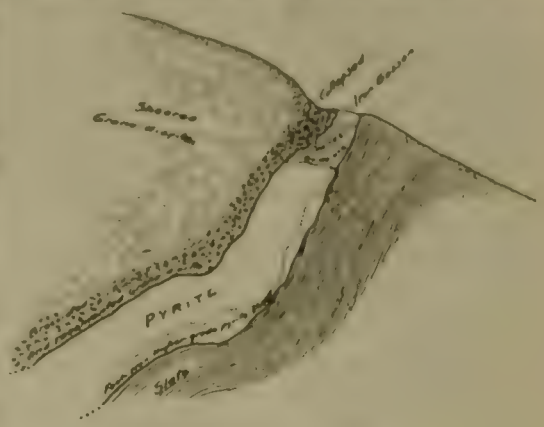
There is some quartz gangue in the ore, as shown by analysis, but it is usually difficult to distinguish underground. In the upper part of the zone, this shows as a fine residual sand, and in places at the bottom of the oxides just above the pyrite, where the lode has not collapsed as it has near the surface, specimens of quartz can be found which at first seem to be massive gangue matter, but which when removed and examined are found to be as light as a dry sponge. It is a filmy coherent skeleton from which the pyrite has been leached. The pyrite and all the other sulphides, as well as the pervading silica gangue, have distinctly the appearance of having been deposited contemporaneously. The ore contains less than 0.005 CaO usually, but it is seldom absent in the scores of analyses which have been made. Arsenic occurs in about the same amount, possibly as an impurity in the pyrite. The iron averages about 36%, the sulphur from 38 to 40, the excess over that required by the pyrite being combined with copper, zinc, and lead. The prevailing copper mineral is chalcopyrite. The gold, silver, and copper at present market prices divide the assay value of the ore almost equally between them.

Lode Structure.—The only structural feature apparently inherent in the pyrite mass is an imperfectly developed system of transverse joints standing at right angles with the walls, probably developed by decrease of temperature and a slight shrinking of the sulphide. These are not sufficiently continuous nor so connected as to form continuous water channels. There are several cross breaks and fractures through the lode, two of which are of some magnitude and have faulted the lode. There has also been a certain amount of post mineral movement along the foot-wall, possibly induced by the cross faulting. All of these fractures are extremely recent, as there is little visible oxidation or other alteration along them. The walls of the pyrite are sharply defined. They curve sharply, but I did not observe anywhere a rough or jagged outline of penetration of the wall rock by ore.

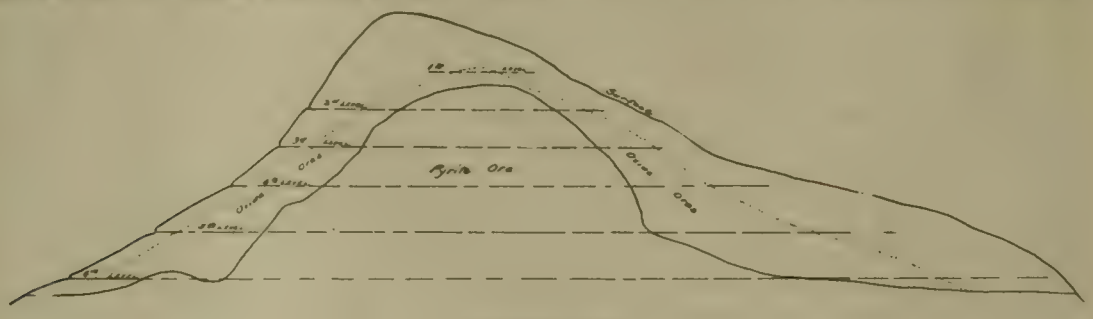
Oxidized Zone.—The top of the oxidized zone is a capping of the usual iron gossan. Below this is a mass of loose quartz sand on the hanging wall side. On the foot-wall side is a body of lead carbonate and oxides of iron, extending upward nearly to the surface and widening downward to the pyrite, at the top of which it extends across the whole width of the lode. The analysis of this ore is 25 to 30% FeO, 25 to 30 SiO_2, 8 to 12 Pb, 1 to 2 As_2O_5, and considerable gold and silver. All the materials of the oxidized zone are residual in origin. The cross-section sketch illustrates a typical occurrence.

Water Level.—In the foot-wall slate, the water level, before the adits drained the ground, was at about the fourth level. The pyrite mass, however, probably always remained saturated to its top throughout the year. The pyrite is not, of course, impervious, but the water which it contained may have stood in it for an age after thermal activity ceased, being held there in sub-capillary spaces, resisting ingress of the annual rains and itself not free to escape. Surface waters enter the slate wall rocks and the recent fractures quite freely, but I believe they have not flowed downward into the massive ore to a notable extent.

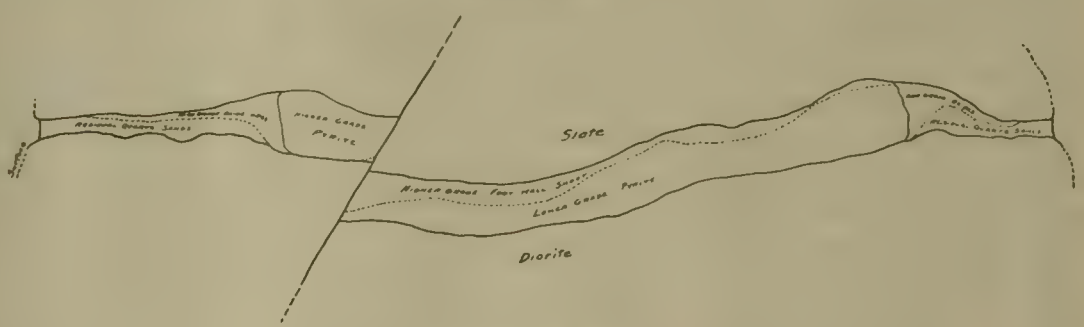
Oxidizing Processes.—There has been very little concentration of copper minerals in the oxidized zone. The copper in solution has drained laterally along the gossan to the surface or through the foot-wall slates. The lead and silver have formed insoluble mineral compounds and are preserved in the oxide ores as shown in the sketches. There is also some enrichment by concentration of gold in the oxide ores. The zone of attack of oxidizing agents in the sulphides appears to have been measurable vertically in inches along practically all the profile of the pyrite.



Ideal Cross-Section Looking West.



Longitudinal Section.



Generalized Plan Diagram.

Descending Sulphide Enrichment.—A little covellite has been found at the top of the pyrite in the Naranjo workings. The superintendent, who is an

engineer and a particularly good mineralogist, states that none has been found in the Reforma. My inquiry as to chalcocite brought the response that it had not been recognized in the pyrite. I saw none.

The higher grade pyrite in the shoots along the walls revealed nothing to the eye which would indicate any sulphide enrichment from above. It is believed that the ores of such shoots were formed by metasomatic replacement from ascending thermal ferruginous solutions which were richer in copper, lead, gold, and silver in the latter part of the long period occupied in replacing the great mass of fissured slate, or, what is equivalent in effect, that the iron in solution became somewhat depleted, thereby increasing the proportionate amounts of the other metals. The line of demarcation between the oxidized ores and the sulphide ores is nearly as sharp as the contact between two rock formations. In profile it is regular and conforms to that of the hill, as would be expected because of the great homogeneity of the mass. In cross-section the top of the pyrite is a flat surface across the vein at the base of the zone of oxides. There is no irregular penetration by the latter. Oxidation is complete as deep as it extends. Along the recent breaks no oxidation or addition of materials not found in the adjacent massive ore was observed, except stalactites and crusts of iron and copper sulphates which have been formed rapidly by water percolating through the fractures, since the adits were driven and ground-water became lowered to an artificial level.

In the planes of crushing along the foot-wall much driving has been done and a theory has arisen that such crushed and soft pyrite is richer than the massive pyrite. Assay maps, however, support the probability that this was richer before it was crushed than the middle of the vein, but it is not shown to be richer in average value than the adjoining massive pyrite of the higher grade foot-wall shoot. If the low-grade mass at the east end of the sixth and fifth levels, where the foot-wall shoot is thin, be averaged in with the other parts of the lode on each of these levels separately, it will give the appearance of a gradual diminution of copper, gold, and silver from the fourth level down. If, however, the lode be divided into shoots, as the assays define them, the results show striking uniformity in both the higher grade and the lower grade bodies. The assays, if so employed, afford no argument for secondary downward sulphide deposition. The lowest grade pyrite, at the east end of the sixth level, is immediately adjacent to the oxidized zone and lies under large bodies of rich lead ores. On the other hand the highest grade pyrite, along the foot-wall, has been developed recently on the sixth level at the place most remote from the oxidized zone.

Acknowledgments.—I wish to express my indebtedness for access to the workings and for many useful and interesting data to the owners and operators of the mines, Don José Maria Ortiz, Don Vicente Ortiz, and to Enrique Ortiz, the superintendent, and to the several other engineers who have at different times been in residence at the mines, whose maps and sketches I was privileged to inspect.

The Black Hills of South Dakota—IV

By William H. Storms

Of the early days in the Black Hills many interesting incidents of the mines might be related—some of them too good never to be placed on record in some manner. Among these is the story of an inexperienced young fellow who was, nevertheless, wide awake, and who not only embraced an opportunity, when it presented itself, but who was prompt to recognize an opportunity at sight. One day he was making a casual call on a friend in Deadwood, who, being a draughtsman, was engaged at the time in making a claim map of the mines in the vicinity of the Father DeSmet mine. Like all claim maps of districts in the Western States, it indicated numerous rectangular blocks lying at many varying angles, frequently overlapping and encroaching upon each other in the utmost confusion. Almost equally were the triangular-shaped blocks, polygons, and other angular forms of unnamable design, and of many sizes. The visitor remarked on this fact, and inquired who owned these odds and ends, and was informed that some were fractional locations, while others still belonged to the public domain and were the subjects for location by anyone disposed to possess himself of them, by merely setting up a 'discovery' stake at some convenient point on the vacant ground.

For some time the young fellow silently studied the map, which was nearing completion, asking questions occasionally about different mines and about certain odd blocks situated in various parts of the map. After a time he announced that he 'must be going,' and accordingly took his departure. He went at once to a stable, hired a horse, and rode up the gulch to Golden Gate and upon the hill above the DeSmet mine, where he spent some time in the investigation of the numerous claim stakes and monuments, being eventually able to identify those he sought. He thereupon located a vacant piece of ground, which in shape resembled a coffin, and was about 400 feet long and 80 feet wide at its widest place. It joined the Father DeSmet, and was directly over the very heart of a large and valuable orebody. He set up his discovery stake, as he had been told, locating the fractional claim. Strange to say he was unobserved all this time, probably because it was no uncommon thing to see men rambling over the hills. He hired a couple of men and set them at work. This was observed quickly enough, and efforts were made by threat and intimidation to dispossess him, but he happened to be one of the kind not easily intimidated, and continued the work of sinking his shaft under an armed guard, maintaining possession until he sold the claim a short time after for, it was said, $60,000.

The owners of one of the claims now constituting the Homestake group were much in need of financial aid and sought it in Deadwood, where they were fortunate enough to enlist the interest of a merchant

who gave the prospectors $100 worth of provisions for a one-tenth interest in their mine. Later the merchant H B Young became so well pleased with the prospect that he had a drift run in on the ore body at his own expense without acquiring any additional interest in the property. Still later, when an offer of a good large sum was made for the mine and which was entirely satisfactory to the miners, Mr Young objected, asking a higher price for his interest and existing as a condition to the transfer that he be permitted to remove all the ore he had caused to be taken out from the adit and in addition to that as much more as he could take out in the succeeding 20 days. This was finally agreed to, but the document was loosely drawn and no stipulation was made confining Mr Young's activities to the advancement of the face of the adit he had run. The following morning he had a crew of men at work breaking down the ground over the adit, and this opening soon grew to very respectable dimensions as an open-cut, in which he increased the number of men as fast as he could find room for them. Every available custom mill in Lead and Poorman was engaged to crush ore from Young's open-cut, and teams were kept busy, night and day, hauling the rock away as fast as it was broken down, throughout the 20 days of the agreement. On this little operation Mr. Young was said to have netted $8000, which in addition to the $10,000 he received for his one-tenth interest, made a total of $18,000—a most satisfactory return for a $100 grubstake. This incident gives some idea of the value of the ore in some of the veins at and near the surface in the Homestake group in those early days—it was not all low grade.

Another incident of the transfer of a mining claim, in a manner out of the ordinary, was that in which a man named O'Leary, who was one of several partners, refused to sell out at a price which was satisfactory to all concerned excepting himself. O'Leary remained in his cabin on the claim and refused to go down to the town, or to allow anyone to come on the claim to discuss the matter, so suspicious was he of dishonesty in connection with the business. He said: "$10,000 in cash—no checks—spot cash," to him in hand paid at his cabin, and he stood ready to enforce his position, for he refused to give up possession until the cash had been paid over. Finally, the money was sent up under a flag of truce, for it was feared he might attempt to shoot anyone approaching the cabin on the hillside, if it were not made clearly evident that he was in no danger. Immediately upon receiving the money, he put it in a valise, and leaving everything else in the cabin, he watched from the door, and when he saw a hack coming down the road on the way to Deadwood, he walked hastily down the hill, got into the hack and went to Deadwood, leaving the country the following day, taking his money with him. Miners are often suspicious, but seldom do they show such entire lack of faith in their fellow men, or in their ability to take care of themselves, as O'Leary did in this instance.

There are men today, and probably always will be, who seem to think that a dollar made by dishonest means is worth several dollars made legitimately. A saloon keeper in Deadwood owned a mining claim in Sheptail gulch near Central City. He had had an adit run in 50 or 60 ft. on the vein and some gold had been found, but not enough to satisfy the owner. Being of an ingenious turn of mind he concluded to undertake the task of improving on the work of the Almighty. He bought a lot of tools suited to his purpose, and with them drilled small holes in the soft seams of the rock. In these holes he placed a mixture of sand, clay, and fine gold, filling and tamping each hole carefully and obliterating as far as possible all traces of his clever work. During six months he put in many a day at this self-imposed task of salting his worthless mining claim, preparing it for the coming of some one, at some future time, on whom he might unload at a good sum profit. One day toward the end of the six months, he went up to his hole and got very warm in climbing the hill. He sat down in the adit and cooled off, and at the same time caught a severe cold which rapidly developed into pneumonia, and in 48 hours he was a dead man. His adit was visited, and the curious set of drills and other instruments he had employed in his work were discovered. Their unusual character led to an investigation, and then was discovered the use to which they had been put. Poor fellow. He might have done far better with his time, talent, and patience.

Never, perhaps, was the value of a knowledge of mineralogy better demonstrated than in the following well authenticated instance: Among the early mines to be opened on the Cambrian conglomerate at Lead, was the Durango. This claim was situated on the hillside west of the Homestake, and in appearance resembled those on the east side of the gold belt, which had paid well, but the cemented gravel of the Durango contained too little gold to make it profitable. This the miner could not understand, but to the geologist the reason was plain. The conglomerate was formed of the detritus of the crystalline schists of the Algonkian, as it was eroded by action of the elements. The region was slowly sinking, and as it sunk the waves continued to encroach upon the land. The angular fragments of rock were tossed and rolled by the waves and soon lost their sharp edges, in time becoming smooth and polished as they were washed to and fro in the surf. The softer portions of the rocks were reduced to sand and silt, and mingled with the pebbles and cobbles, forming gravel. As the sea slowly advanced, the conglomerate covered the schists, in time reaching the great gold-bearing outcrops of the gold belt. For some time the gold derived from the degradation of these outcrops had been washed down and mingled with the gravel of the shore deposit. After a very long time the gold-bearing zone itself was completely covered and then, although the conglomerate continued to be deposited as before, it was no longer gold-bearing, or at least only slightly so, and it was here that the Durango mine was located, where the source of the gold in the conglomerate was buried beneath the bed previously formed. It is well to note, at this point, that the conglomerate contains

no fragments or pebbles of any of the eruptive rocks now so abundant about the Homestake region. The conglomerate was formed at the base of the Cambrian in the Black Hills (equivalent to the middle Cambrian of the Rocky Mountains), while the igneous rocks of the region referred to were erupted after the close of the Cretaceous. This fact, in itself, proves that the Algonkian schists were gold-bearing before the introduction of the eruptive rocks of the district.

Overlying the conglomerate of the Durango mine was a bed of dense quartzite, which at that point was heavily impregnated with a black iron ore. Thousands of men, most of them miners, had seen this ore from the time it first was uncovered by the prospect work on the Durango mine in 1776, up to 1899, but none of those who saw the ore considered the mineral of any particular value, believing it to be some kind of iron ore. In January 1899, a professor in the public school at Lead City, was taking a stroll about the hills and chanced to pass along an old ditch that had been run across the Durango claim years before. When he came to the Durango dump he stopped to examine the ore lying about so abundantly, and picked up a piece of the iron ore. Its unusual weight at once attracted his attention, and he correctly suspected it of being a tungsten ore, which a test at the laboratory quickly confirmed. Ore to the value of $25,000 was shipped from this deposit as the direct result of this knowledge, in which the discoverer participated.

As a sequel to this discovery, Otto Grantz, an owner of numerous locations, began prospecting operations on one of his claims known as the Hidden Fortune. He sought wolframite, but found little of the mineral; he did find, however, gold in considerable quantity, taking out over $70,000 in two months.

As has been stated in a former chapter, water in the vicinity of the great mines of the Homestake Belt, that was readily available, by gravity, was scarce in the early days—that is, water for milling purposes on a large scale. In 1878 the Father DeSmet company expended about $400,000 in the construction of a ditch and flume line which was intended to bring a large quantity of water to Central City from the main Spearfish canyon, for use in the 100-stamp mill and for such other purposes as might require it. Hundreds of men were employed; sawmills were built out in the mountains miles from any settlement, but near the line of the canal survey. Millions of feet of lumber were cut and miles of flume built, besides miles of ditch completed. Six miles northwest of Central, in a direct line, and near the site of the town now known as Carbonate, which was afterward built, two tunnels were driven through hard rock, one of which was 1500 feet in length, and the other nearly as long. These were on the canal line and were designed as part of the system. The plans also contemplated several large and expensive 'inverted siphons,' the pipe for which was brought and delivered, but the big job was never completed—for the reason, as was stated by some, that water could not be made to run up hill, from which it may be inferred there had been an engineering blunder.

In those early days any proposition which promised a permanent water supply was valuable. No one then in the country realized better than Samuel McMasters, the first superintendent of the Homestake, the scarcity, and consequent value of a permanent water supply, and he was ever alert to learn of new sources of water that might be developed, if necessary, and brought to the mines. Some prospectors had located a claim in Nevada gulch, about five miles from Lead. They drove an adit on the vein and had an encouraging prospect of gold, but the vein was small and they were much troubled by an unusual amount of water, which flowed out of the adit like a small river. One day McMasters rode up that way, on one of his frequent trips of observation. He did not fail to promptly notice the fine stream of water issuing from the adit of the prospectors, and dismounting, engaged the miners in conversation regarding their mine. After a brief examination he agreed with them that they had a fine prospect, but, as yet, a long way from being a mine, besides which, he assured them that they would find the water a very expensive proposition to handle when they commenced to sink, which was the thing next to be done if they hoped to develop a permanent mine. After considerable talk he inquired what they would take for the prospect. They promptly asked $10,000, evidently having made up their minds to this previously, with no idea that the great Homestake company would ever so much as look at their little prospect. After considerable haggling on both sides McMasters is said to have offered $6000 cash, which the prospectors accepted. The transfer was made the following day, but when the men returned to their cabin a day or two later, they were much surprised to see several men industriously digging a ditch in which a wooden box-flume was being laid as fast as the ditch was completed, and then covered with earth. They found a substantial bulkhead in the adit and the ditch headed for the Homestake mine. They looked at each other for a moment, in silence, and then one of them said, "It was the water." "Yes," replied the other, "I thought it was damned funny that McMasters would buy this little prospect—it was the water. We sold out too cheap."

Over in the Nigger Hill district, the men who went into that region in the latter part of 1875, and early in 1876, 'struck it rich.' The placers of Bear gulch, Sand creek, Potato gulch, and other smaller streams heading in the high ridge known as Nigger Hill, were rich in coarse gold. Not only were the stream beds rich, but the dry gulches and draws at the very heads of the streams of the district, and in some instances the flat tops of the hills also were rich—some of the dry diggings paid better than any other place. In some respects the dry placers of the Central Hills resemble those of Nigger hill, of which, more later.

The negroes who discovered this district were mostly from Montana, where they had worked in the placers in that State, so were not unfamiliar with the work. The district is isolated from the other mining districts of the Hills, constituting a separate domal uplift exactly typical of the main Black Hills uplift. Here also the Algonkian schists and intru-

sive granite are exposed at the surface by the erosion of the sedimentary beds, the exposed edges of which encircle the area in a series of wall like scarps. The early adventurers found pay gravel the first day spent in the district, but the best was found later where they least expected to find it, in the flats and shallow draws on the summit of Nigger hill. A number of small gulches ran down the slopes of the ridge, among them Potato, Mallory, and Shirt Tail. These were all rich in coarse gold and were worked out in the course of a few months. In one instance, a miner worked industriously on his claim situated on Mallory gulch, up near its head. By working early and late, packing the dirt several rods to a water hole and washing it in a rocker, he was able to make from $3 to $4 a day, but this was no wages for those times; and on learning that men were making $10 a day and over, on Whitewood, near Crook City, he quit his dry diggings on Mallory gulch and made haste to Whitewood. A negro, well known to everybody in those days as 'Nigger Miller,' appropriated the claim and went to work. He found the gold coarse, but not as abundant as he wished, so he concluded to strip a little piece of ground and work only the dirt taken a few inches above bedrock, thus taking the cream of the deposit. He was much disappointed to find, when he came to wash the dirt, that he had nothing. He thought this strange, and concluded to try again, taking the earth in horizontal sections, about six inches deep, at a trial. He found little or no gold the first 30 inches below the surface, but at that depth he found the pay-streak and held it by careful prospecting. He worked the claim out and told me that he made on an average over $30 a day. This man Miller was the enterprising fellow who took his placer outfit to the Centennial exposition, at Philadelphia, in the summer of 1876, after his clean-up on top of Nigger hill, and there washed gravel for the edification of the thousands who passed.

The miners of this district were troubled from the first with a heavy, dark-colored sand which accumulated in their sluices, concentrating with almost the facility of the gold, as it seemed. It was the bane of the clean-up, and were it not for the fact that the gold was coarse and heavy, the loss in gold must have been considerable. This material they thought to be iron ore of some sort and of no value whatever, so it was thrown out wherever found, and it was not until 1883 that they learned that their 'black sand' was mostly cassiterite. Just prior to this discovery tin-stone was found at the Etta mica mine, in Pennington county, near the old village of Harney.

The Etta mine had been worked for mica, but with small success. When it was learned that the mine contained tinstone its development was vigorously continued, and in 1885 a concentrating mill was built near the mine to treat the rock from the Etta and other mines owned by the company in the district. The mill was an elaborate affair, and designed for large capacity, but the developmtnt of the mine proved disappointing, for there was not enough tin-bearing rock to keep it in operation.

THE KOSAKA COPPER MINE OF JAPAN

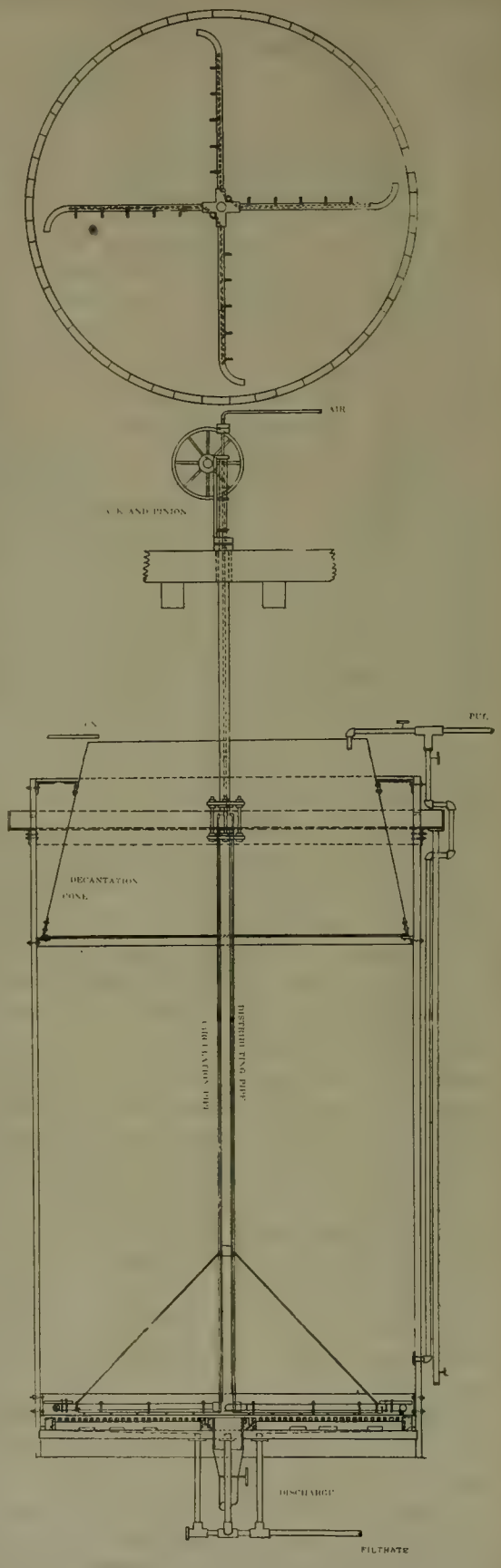
The Fujitagumi is one of the largest commercial enterprises of Japan, according to the report of K. Tsujimoto. Its principal business is mining, and its chief mining operation is the Kosaka copper mine, situated in the province of Rikuchu, near the northern end of Hondo, the largest island of Japan. The mine was discovered in 1861 and was first worked for silver. It continued to be worked as a silver mine until 1897. Up to that time operations had been confined largely to the oxidized zone, but the sulphides becoming more abundant with depth, preparations were made to treat the ores, which are complex sulphides (black ores), for the copper contained, the silver and gold becoming by-products of the operation. The ores contain considerable zinc, but the copper predominating, the zinc has received little attention thus far, though experiments are being made on the copper slags with a view to recovering the zinc from them.

The ores occur as impregnations in sandstone at and near the contact of a dike said to be liparite (a felsitic purplish rhyolite). The block of ground thus far explored it 2200 ft. long, 800 ft. wide, and 500 ft. deep. The minerals are chiefly pyrite, chalcopyrite, blende, galena, and barite. Silica is abundant in some parts of the deposit. Ore mixtures are thus possible which fuse readily in the furnace. Mining was formerly carried on by underground stoping but this method has been abandoned for the open-cut bench, in general after the system in vogue at Mount Lyell, Tasmania. There is a vast amount of overburden to be removed, estimated at 8,000,000 tons. The glory-hole is now 2200 ft. long by 1000 wide at the top and the sides of the pit are as steep as it is considered safe to make them. From 2000 to 3500 tons of overburden, and 1000 tons of ore are removed daily. The ore is taken to the smelters 6000 ft. distant from the mine, by electric railway. Pyrite smelting with a 10-oz. cold blast is the practice. The Japanese metallurgists have succeeded in making a success of introducing 3% of carbonaceous fuel (coal) into the zone of fusion through the tuyeres. The matte runs 30% copper. This is re-smelted to 50% matte which after crushing, is calcined in a Herreshoff furnace, and later reduced to blister copper in a reverberatory. Two stands of converters are being installed to replace the present method of desulphurizing the matte to 'blister.' Electrically operated cranes, tamping machines for lining converters, and other accessories of a modern smelting plant are being added. There are seven smelting furnaces, of which the newest is the largest, being 60 ft. long by 3 ft. 6 in. wide at the tuyeres. There are 116 tuyeres of 6-in. diameter. The slag from the second matte contains a quantity of lead and copper. This is re-smelted and the lead extracted as 'bottom,' which is squeezed in a liquation hearth, and the lead is desilverized in a Parkes pot. The zinc scum, which contains gold and silver, is distilled and the bullion sent to the mint. The output annually is about 11,000 oz. gold, 1,125,000 oz. silver, 15,000,000 lb. copper, and 278 tons lead.

New Cyanide Device

By Lee Fraser

The rate and extent of the dissolution of gold and silver in cyanide solutions depends almost wholly upon certain variable conditions, the most important of which are: temperature, cyanicides, concentration of solution of cyanide, relative proportion of volume of solution and mass of substance, physical condition of solution and substance while undergoing treatment, oxygen, area of metal exposed to solvent, and physical condition of metal to be attacked by solvent. Various machines have, from time to time, been contrived, designed to take an especial advantage of one, or a combination of several of the above conditions, to effect a complete dissolution of the precious metals contained in the substance under treatment. To this number, already extensive, I propose here, to add another. The function of the agitator in slime treatment is to create and to maintain a physical condition of the solution and substance, most advantageous for the progress of the chemical reactions in dissolving the gold and silver. The variable conditions whose regulation, to give maximum rate and extent of dissolution of the gold and silver, lies within the scope of the agitator, will generally comprise: temperature, physical condition of solution and substance undergoing treatment, oxygen, and cyanicides. With but one notable exception, the numerous types of agitators have confined themselves to the regulation of the three latter conditions, neglecting the first.



As in any machine, further considerations of efficiency, first cost, and cost of operation, are of vital importance, so that even though a certain machine may make possible a decidedly increased extraction over another, its operation may be prohibited, on account of its failure to compare favorably with other machines, in one or all of these conditions. In the agitator, shown in the accompanying sketches, it has been aimed to regulate only the last three of the first mentioned conditions, and to provide an efficient, economical, and inexpensive machine. It has been designed to also perform the offices of pulp thickener and collecting tank, in which capacities it greatly simplifies any installation of equipment for the treatment of slimes.

It is contemplated that a cycle of operations will consist in the following: The pulp from the classifier is charged into the tank, preferably through the lower outlet, simultaneously with the admission of air into the distributing pipes. The tank is allowed to fill until the pulp overflows into the vertical circulation pipe, when filtration is commenced, by gravity; or, if necessary, assisted by vacuum. At this same time the circulating pipes begin to revolve, due to the flow of pulp through them. This flow is caused by the air from the distribution pipes, which are led into the circulation pipes near the openings at the ends of the arms, forcing the pulp in the arm, out into the tank, thus producing a difference in hydrostatic pressure. Assisting to produce the revolution of the circulation pipes, is the action of the air from the nozzles of the distributing arms upon the surface of the filter bottom. The action of the air from the nozzles, which are flattened to a fish tail, serves

to maintain a clean filtering surface practically free from settling slime or sand deposited by suction. The nozzles are spaced at points on a spiral curve and with the positions every portion of the filtering surface receives a cleaning at each revolution of the arms. The flow of pulp continues with the filtration until a point is reached where the consistence of the pulp in the tank is that required for cyanide treatment, when cyanide solution is added and the water in the pulp displaced before submitting the filtrate for precipitation of the gold and silver. As an auxiliary in thickening, decantation is practicable by placing an inner lining about the upper rim of the treatment tank. Fresh solution is allowed to flow into the tank at the rate the filtrate leaves it, while air is constantly admitted, producing violent agitation and plentiful aeration, as already mentioned. When extraction has reached its maximum, the pulp is discharged through the valve gate in the bottom of the tank.

I have attempted here to give a statement of what this agitator is expected to accomplish. Its apparent advantages, low first cost, low cost of operation, high rate of efficiency, adaptability for use as collecting tank, and slime pulp thickener, simplicity of parts, and celerity and completeness of extraction of the gold and silver, have not at this stage been entirely proved by demonstration on an extended or a practical working scale.

PHOSPHATE DEPOSITS IN THE WEST

The availability of even low-grade phosphate rock for use as a fertilizer gives importance to the enormous phosphate deposits in Idaho, Wyoming, and Utah, many of which are on government land. The total area of public phosphate lands now withheld from entry is more than two and a half million acres. Portions of the lands thus withdrawn were examined in 1909 by geologists of the United States Geological Survey, whose reports have just been published as an advance chapter of the Survey's Bulletin 430, numbered Bulletin 430-H. This chapter includes two reports, one on deposits in southeastern Idaho and adjacent parts of Wyoming and Utah, by H. S. Gale and R. W. Richards, the other on deposits near Ogden, Utah, by Eliot Blackwelder. The reports discuss the geologic age and relations of the deposits, their origin and chemical composition of the rock, and are illustrated by maps and geologic sections. The phosphate rock is chiefly of oolitic structure, that is, it consists of masses of round grains closely cemented together with other materials, generally calcite. These grains differ greatly in size in each mass of rock, ranging from microscopic pellets to pebble-like bodies half an inch in diameter. Chips of shells and small fragments of plants are in places included in the rock. The rock at different places differs in color, ranging from gray to jet black, the darker shades being probably due to the presence of bituminous matter. Bulletin 430-H may be obtained without charge by applying to the Director of the Geological Survey at Washington. This bulletin is a part of annual contributions to Economic Geology for 1909.

Air Lift Pumping

By Edward A. Rix

*It is still a popular fancy that air in lifting fluids from depths acts in a great measure on an ejector principle and all sorts of nozzles and cones are designed to take advantage of this supposed action of compressed air, but it is all much simpler than that, and the basis of the lift action of air lies in the fact that the discharge pipe contains a mixture of air and water which weighs less than the solid water and which surrounds the discharge pipe, consequently the heavier surrounding water pushes the enclosed lighter mixture upward causing the phenomena known as 'air lift pumping.'

Most pumping experiments by this method lie within the limits of 125 ft., consequently the commercial tables, curves and data in general have been calculated for such conditions, and these will be helpful in consideration of deep well pumping.

In discussing air lifts certain general terms are used and must be understood. By lift is meant distance from the surface of the liquid being pumped to the point of its discharge. By submergence is meant the depth of the discharge pipe under the surface of the liquid being pumped. By percentage of submergence is meant the ratio of the length of the submerged portion of the pipe to the total length of the discharge pipe. The total length of the discharge pipe will of course be the lift plus the submergence. For example, if the surface of the water be 100 ft. below the point of discharge this would be called a lift of 100 ft.; if the discharge pipe extends below the surface of the water 150 ft. it would be called submergence of 150 ft., the total length of the discharge pipe would then be 250 ft. and the submergence would be called 60%. If there be a given ascertained percentage of submergence the actual submergence may be ascertained by multiplying the lift by the percentage of submergence and dividing this product by one hundred minus the percentage of submergence, expressed as follows:

$$\text{Submergence} = \frac{\text{Lift} \times \text{per cent of submergence}}{100 \text{ per cent} - \text{per cent of submergence}}$$

Thus in the above example,

$$\frac{100 \times 60}{100 - 60} \text{ or } \frac{6000}{40} = 150 \text{ submergence}$$

From the beginning of air-lift experience it was assumed that the most economical condition for air-lift pumping was when the submergence was 60%, but recent developments have somewhat shaken this idea and it is doubtful whether there has been enough of accumulated data collected on this subject to make any definite statements.

The first formula used for determining the amount of free air required to do pumping, assuming 60% submergence, was as follows:

$$\text{Quantity of free air required} = \frac{\text{Gallons and lift}}{125}$$

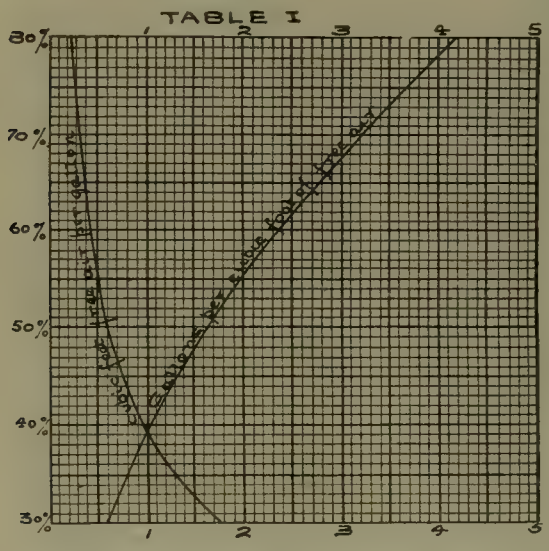
This is a rough rule which still holds good for small lifts, up to 100 ft., but it is too generous for deeper pumping. For example, if it be desired to know the

*Abstract from *The Oil Industry*.

amount of free air required to pump 100 gal. per minute 125 ft. high the result would be:

$$\text{Quantity} \quad \frac{125}{100 \cdot 125} \quad 100 \text{ cubic feet}$$

of free air, and the pressure required would always be measured by the submergence; thus in the above problem the lift being 125 ft. and the submergence 60%, the submergence would be 1½ times the lift or 187 ft., and the working pressure would be that due to 187 ft. Strictly speaking this would be about 80 lb., but inasmuch as there is pipe friction to be considered it is safe to take this pressure in pounds equal to one-half the submergence, thus one-half of 187 is 93½ lb., which would be a safe working pressure for such conditions.



When compressed air is introduced in the well in a finely divided state so that the bubbles are small and evenly distributed throughout most of the water the best results are produced. It is evident that if the air pipe merely discharges the air into the water with the full opening of the pipe the result will be large bubbles instead of the finely divided condition which is desired. This has led to the construction of many different patterns of what are called 'pump heads,' which is another name for the extremity of the compressed-air pipe fashioned in such a manner as to distribute the air to the best advantage to the water being pumped.

The Indiana Air Lift Co. issues an interesting diagram, which I have marked table No. 1, and the table of dimensions which I have marked table No. 2. These may be considered fairly accurate at the lifts from 10 to 125 feet.

With these two tables it is easy to determine all the elements of an ordinary air-lift installation for pumping water. Having determined the percentage of submergence by dividing the submergence by the submergence and lift—let us say it was 50%, look along the left hand edge of table No. 1 and find 50% and follow along to the right until it intersects the second curve and you will have the value 1.65 which means that at that submergence one cubic foot of free air will lift 1.65 gal. of water.

TABLE II.
Capacities of Air Lift Pumps

Air Pipe	Size Pump	70%	65%	60%	50%	40%	33%	Size of Well
⅜	1	15	10	10	9	8	6	2½
½	1¼	30	15	15	13	10	8	3
¾	1½	40	25	25	22	15	10	3¼
¾	2	75	55	45	40	30	20	4
1	2½	100	80	75	65	50	30	4¾
1	3	200	120	110	95	70	50	5⅝
1	3½	225	150	150	125	90	70	6
1	4	350	200	200	170	125	90	6⅝
1¼	4½	450	275	250	210	170	120	7⅝
1¼	5	550	350	320	260	200	150	8
1½	6	800	500	450	380	300	200	9⅝
1½	7	1200	750	650	550	425	300	10⅝
2	8	1700	1000	800	675	525	400	11⅝
2	9	2000	1250	1050	900	700	500	13
2	10	2500	1600	1300	1100	900	600	14

Table No. 2 gives the proper sizes of the Indiana pump heads and the proper sizes of water and air pipes for any given condition. Following up the previous problem of 50% submergence, if it be wished to deliver 125 gal. of water per minute the 50% column should be followed down to 125 gallons, then on the second column will be found the size of the Indiana pump head, namely 3½ inches.

TABLE NO. III.
APPROXIMATE CUBIC FEET OF FREE AIR AND WORKING PRESSURE REQUIRED TO RAISE ONE GALLON OF WATER BY AIR LIFT.

$$\text{FORMULA} = \text{Log.}\frac{H+34}{34} \times 234$$

H=Submergence in Feet

L=Lift in Feet

RATIO OF SUBMERGENCE TO LIFT

Lift in Feet	25% ⅓ to 1		33% ½ to 1		43% ¾ to 1		50% 1 to 1		55% 1¼ to 1		60% 1½ to 1		66% 2 to 1		70% 2½ to 1		75% 3 to 1	
	Free air Cubic Feet	Working Press	Free air Cubic Feet	Working Press	Free air Cubic Feet	Working Press	Free air Cubic Feet	Working Press	Free air Cubic Feet	Working Press	Free air Cubic Feet	Working Press	Free air Cubic Feet	Working Press	Free air Cubic Feet	Working Press	Free air Cubic Feet	Working Press
20							.428	9	.365	11	310	13½	.252	18	.217	22½	.195	27
30							.470	13½	.400	17	.350	20	.290	27	.255	34	.230	40½
40							.508	18	.435	22½	.387	27	.325	36	.287	45	.263	54
50							.546	22½	.470	28	.422	34	.360	45	.320	56	.285	67½
60							.582	27	.510	34	.457	40½	.392	54	.350	67½	.323	81
80							.653	36	.575	45	.522	54	455	72	.410	90	.380	108
100					.850	34	.720	45	.640	56	.585	67½	.512	90	.465	112½	.433	135
120					.915	40½	.785	54	.703	67½	.642	81	.567	108	.520	135	.483	162
140					.982	47	.847	63	.763	79	.697	94½	.622	126	.572	157½	.533	189
160					1.047	54	907	72	.820	90	.755	108	.675	144	.624	180	.583	216
180					1.107	61	.965	81	.875	101	.810	121½	725	162	.672	202	.630	243
200	1.8	30	1.436	45	1.167	67½	1.022	90	.930	112½	862	135	.775	180	.720	225	.675	270
250	1.96	38	1.592	56	1.312	84	1.156	112½	1.069	141	.988	168	.895	225	.830	282		
300	2.12	45	1.750	67½	1.507	100	1.292	135	1.206	169	1.110	200	1.010	270	.942	338		
350	2.28	53	1.897	79	1.635	118	1.449	157½	1.317	197	1.232	236	1.110	315	1.050	394		
400	2.45	60	2.045	90	1.725	135	1.542	180	1.429	225	1.345	270	1.232	360	1.155	450		
450	2.60	68	2.182	100	1.850	152	1.669	205	1.542	253	1.457	304	1.337	410	1.280	506		
500	2.74	75	2.328	112½	1.952	169	1.790	225	1.657	281	1.570	338	1.442	450	1.356	562		
550	2.88	83	2.455	128	2.105	185½	1.907	247½	1.772	309	1.678	271	1.564	495				
600	3.02	90	2.564	135	2.225	205	2.018	270	1.884	337½	1.784	410	1.642	540				
650	3.16	98	2.730	146	2.345	219	2.175	292½	2.012	365½	1.908	438	1.742	585				
700	3.31	105	2.845	157½	2.460	236	2.258	315	2.100	394	2.000	472	1.842	630				
750	3.45	113	2.970	169	2.576	256	2.353	337½	2.225	424	2.080	512	1.935	675				
800	3.60	120	3.095	180	2.690	270	2.465	360	2.320	450	2.190	540	2.063	720				
850	3.72	128	3.215	191	2.800	287	2.570	382½	2.410	478	2.29	574	2.125	765				
900	3.85	135	3.338	202½	2.915	304	2.675	405	2.50	506	2.325	608	2.220	810				
950	3.98	143	3.455	214	3.0	322	2.780	427½	2.610	535	2.485	644	2.310	854				
1000	4.11	150	3.575	225	3.465	337½	2.885	450	2.710	562½	2.580	675	2.407	900				

which is also the size of the discharge pipe. On the first column will be found the size of the air pipe; I in., and on the extreme right hand column will be found the smallest size well that will contain the outfit, namely 6 inches.

It will be noted that no mention is made of the lift, because the table being intended for ordinary conditions of 120 ft. or less, it has been assumed that it takes the same number of cubic feet of free air to lift 10 gal. with 60 ft. submergence as 10 gal. lifted 80 ft. with 120 ft. submergence, the working pressure only changing, in the former case being 20 lb. and the latter 40. Now this assumption is not exactly true, but within the practical limits of these lifts it is near enough to be a good convenient rule. When more accuracy is required for greater depths table No. 3, calculated by George H. Reichard, is valuable, as it takes into consideration the expansion of the air bubbles on their way from the lower depths to the surface.

The reason these expansions must be taken into consideration is evident from the very nature of the action of the air lift. Inasmuch as the action of the air lift depends upon an emulsion of air and water, which mixture is lighter than water, it is evident that a perfect condition would be where the bubbles, when introduced at the bottom of the well would maintain the same size in their passage to the discharge. It will readily be seen, however, that inasmuch as the pressure is relieved from the air bubbles as they rise toward the surface, the bubbles get larger and larger, the proportion of air to water increases exactly in proportion to the expansion and this decreases the efficiency of the lift.

The quantity of air given in this table, No. 3, is $2\frac{1}{2}$ times the theoretical quantity required to do the work. Two and one-half has been selected as a co-efficient in this matter as a result of experience. Some engineers have advocated the use of 3 and even $3\frac{1}{2}$ as a co-efficient, but I believe that the table as given to be approximately correct. In the first line of the table the percentage of submergence is given; also the ratio of the submergence to the lift. After having determined the amount of free air necessary to do the pumping and the pressure required, then

TABLE NO IV.
Brake Horse Power to Compress 10 Cubic Feet Free Air Per Minute.

Gauge Pressure	Brake H. P.	Gauge Pressure	Brake H. P.	
5	.235	130	2.14	
10	.435	140	2.23	
15	.606	150	2.31	
20	.756	200	2.60	
25	.9	250	2.85	
30	1.02	300	3.07	TWO STAGE
40	1.25	350	3.26	
50	1.45	400	3.40	
60	1.60	450	3.54	
70	1.77	500	3.68	
80	1.92	600	4.00	
90	2.05	700	3.85	
100	2.18	800	4.00	THREE STAGE
110	1.98	900	4.16	
120	2.07	1000	4.32	

by reference to table No. 4 the brake horse-power to compress the air may be determined. This table shows the actual horse-power necessary to compress 10 cu. ft. of free air per minute to the pressure mentioned. An allowance is made in this table for friction and other losses of power, and is generous enough to allow an ample amount of power to do the work.

OLD TIMES AND THE NEW

As compared with a modern California gold mill with its heavy stamps, rapid drop, low discharge, massive mortars and concrete foundations, the following description of the 40-stamp mill of Hayward's Eureka mine at Sutter Creek, Amador county, California, as it was in 1866, is interesting. The mortars had heavy cast iron bases 4 in. thick, with low trough, and the upper portion of wood. The stamps weighed 450 lb. when newly shod, and dropped 11 in. 80 times a minute. The shoes and dies were 7 in. diam., and both were used until completely worn out. They were of cast iron and lasted from four to six weeks. The discharge was 11 in. above the top of the dies when the latter were new, and this distance increased as the stamp wore down. The mortars discharged on one side only, as they generally do now, and the screen opening was about 46 in. long and but 2 in. high. No. 11 Russia iron slotted screens were used, and these were provided with vertical slots $\frac{1}{2}$ in. long. The screens were reversed when the lower edge was worn. The amalgamation was entirely accomplished inside the mortars, the gold being caught on a copper plate 4 in. wide, situated just below the screen—what would be equivalent to the modern chuck-block. On this plate the gold collected in cakes which were broken off in chunks by means of chisels. Under the screen no outside copper plate was employed, the pulp falling on a rough pine board, which was thought to afford a better index of the condition of things inside the battery than a copper plate would. This idea Mr. Hayward maintained to the end, and in all of his mills the rough pine board was always found immediately beneath the iron lip of the mortar. There is no doubt that the idea is an excellent one, as it is a fact that the board is as good an indicator of the condition of the amalgam inside as can be found. All of the early stamp-mills of California were not of this type, for at the Eureka mill at Grass Valley, there were 20 stamps of 815 lb. each; the Allison Ranch mill, below Grass Valley, had 12 stamps of 1000 lb., and the Rocky Bar mill, also in Nevada county, was equipped with 16 stamps weighing 1025 lb. each.

The tendency today is toward heavier and still heavier stamps and the crushing of large tonnage. This is a natural outcome of the development of large mines upon ores so low in grade that to secure a profit everything must be done upon a great scale. Mining methods have been introduced which make the mining of huge orebodies inexpensive. Transportation has been reduced to a science both under and above ground, and the mills are crushing from 5 to 10 tons per stamp daily, where formerly but 2 to 3 tons was considered the daily duty of the stamp.

In retorting amalgam the lower end of the discharge pipe must not project beneath the surface of water in the pot set to receive the re-condensed mercury, as an explosion may result. A wet cloth should be wrapped about the pipe and this may be allowed to extend down into the water.

Gold Mining in Randsburg Qurdrangle, California

By Frank L. Hess

*The Randsburg quadrangle is included between 35° 15′ and 35° 30′ north latitude and 117° 30′ and 117° 45′ west longitude. The town of Johannesburg is almost in the centre of the quadrangle, and Randsburg lies a mile west. Johannesburg is at the end of a branch of the Santa Fe railway which joins the main line at Kramer, 28 miles south. The town is 90 miles north and 30 miles east of Los Angeles. The area is part of the Mohave desert and has an arid climate. The country is dry, vegetation is scanty, and if a water level exists it has been found only in the basins into which the short periodic streams flow. To judge from the topography of the country, a similar climate has been in existence here through a considerable length of time, for the present erosional forms have probably been shaped largely by weathering agencies similar to those now observed.

The variation in altitude in the quadrangle amounts to about 3000 ft. The lowest altitude, a little less than 2300 ft. above sea-level. The highest point, Red mountain, 5270 feet above the sea, is two or three miles southeast of the centre.

There are three mountain masses ordinarily referred to as the Rand mountains, the Lava mountains, and the El Paso mountains, from which the Summit range extends easterly.

The Rand mountains rise with a gentle slope from the southeast almost or quite to the summit; but on the northwest side they drop steeply to the valley, which is 500 to 1000 ft. lower than points on the southeast side that are equally distant from the crest. Randsburg is situated in a valley in the Rand mountains, three miles from the northeast end. Johannesburg is in a cut through the range, one mile east and a little north of Randsburg. Beyond Johannesburg the mountains do not stand so high above the surrounding country. Nearly all the gold mines of the area, except some small placer mines, are in this range or in a spur from it.

The Lava mountains include the highest peak of the area, Red mountain. Altogether they cover about 50 square miles.

Faults.—A prominent fault follows the south face of the El Paso mountains and crosses them about the middle of the quadrangle on the Kern-San Bernardino county line. The scarp of the fault can be seen from the south for many miles. It can be readily followed west of the quadrangle for a number of miles, and on the east it can be seen cutting across the end of the Slate range, 20 or 25 miles away. At Garlock, two miles west of the quadrangle, a large alluvial fan cut through by the fault shows a face 280 ft. high. Just within the quadrangle, near its western boundary, are two large depressions formed by the subsidence of the surface along the fault. One is a quarter of a mile long, 600 ft. wide, and 75 ft. deep, and the other, half a mile east, is over a mile long, a quarter of a mile wide, and 50 to 125 ft. deep. These blocks have dropped in comparatively recent years, though men who were in the country as early as 1863 state that the sinks were there at that time.

Geology.—The rocks of the quadrangle show considerable variety, but though two or three of the igneous rocks have rather exceptional structure there are no remarkably unusual types. Granite occupies the surface of nearly one-half of the quadrangle.

Granites.—There are two main granite areas, one being a broad, wedge-shaped area in the south end of the quadrangle, with the apex 2½ miles south of Johannesburg, and another extending from the Summit range northward east of El Paso peak to the edge of the quadrangle. There is also an intrusive granite which cuts across the Rand mountains on the south side of Randsburg. It is four miles long and one-half mile wide, forming four of the more prominent peaks. A part of this intrusion is much mixed with schist. This intrusive mass is probably younger than the large mass to the south, for the latter seems to be under and may be older than the schists of the Rand mountains, whereas the granitic intrusion near Randsburg cuts the schist and probably the granite on the south. It has many phases and in places is basic. The granite at Randsburg was not all intruded at one time, but the periods between the successive intrusions were short, geologically. During the same period of time in which the granite was intruded many narrow porphyritic dikes of various compositions and textures were intruded. Some of the more acidic ones cut the granites and diabase dikes. In other places they are cut by the granite and by the diabase.

Sedimentary Rocks.—The sedimentary rocks include the schists of the Rand mountains, the less altered rocks in the northwestern corner of the quadrangle, and a much younger series of poorly consolidated sandstones and clays which crop out from under the lavas and which are also found at Summit Diggings and near the northwest corner of the quadrangle. The rocks of the Rand mountains are mostly schists with minor interbedded quartzites and greatly altered limestones.

On the southeast side of the mountains and around Randsburg and Johannesburg the schists are thinly fissile and of a dull-gray color. They may be classed as mica-albite schists. Little is known of the age of the schists, and no schists similar to those of the Rand mountains are known within many miles in any direction. The sediments in the northwest part of the quadrangle consist of quartzite, mostly fine grained, but with a few beds of coarser material; silicious shales; and limestones, most of which contain a considerable amount of impurities. The limestones contain much chert and in places are so silicious that little calcium carbonate is to be seen.

Lavas.—The lavas are largely andesites, with some basalt, but include more acidic varieties, rhyolite, and probably latite and dacite. There is some obsidian among them. Five miles northeast of Johannesburg fragments of the coarse basal part of the schists are included in the lava, showing that it must

*Abstract from Bull. 430-A, U. S. Geol. Surv., 1909.

have broken through, including these fragments.

Fragmental Deposits.—The fragmental deposits such as sand and gravel cover considerable areas. About two miles east of St. Elmo a shaft was sunk 250 ft. without striking bedrock. In a low range of hills two miles north of Randsburg, in the small valleys tributary to the large one, shafts have been sunk more than 100 ft. without striking bedrock, though it shows in the low cuts on either side. Small valleys have been entirely filled and the hills on either side covered. At Goler the gravels are at least 800 ft. deep, as shown by wells drilled by the Yellow Aster Mining Co. On the north side of the valley between Randsburg and Goler there is a large accumulation of debris, forming hills 350 ft. high. They extend half way across the quadrangle to Summit Diggings. In them is a great quantity of lava boulders, remnants of flows from Black mountain, a few miles west of the north end of the quadrangle. Only a small area of gravels, at Summit Diggings, are of economic importance.

History and Condition of Mining.—Gold was discovered in Goler Wash, nine miles northwest of Randsburg in the winter of 1893-94. Dry-washing camps soon sprang up there and in Last Chance canyon, Red Rock canyon, and Summit Diggings. The site of the last-named camp is in the quadrangle. In 1895 the Yellow Aster mine was discovered by C. A. Burcham, John Singleton, and Fred Mooers, and other discoveries quickly followed. A railroad was soon constructed from Kramer, on the Santa Fe railway, to Johannesburg, and water was piped from wells six to eight miles distant.

The mines, including the dry placers, have probably produced between $9,000,000 and $10,000,000, of which the Yellow Aster mine has taken out about $6,000,000. A number of the smaller mines are worked by the leasing system, paying from 10 to 25% royalty, generally after deducting milling charges, but sometimes gross. Besides the Yellow Aster's stamp-mills, with 100 and 30 stamps, there are the Phoenix, 6 stamps; Red Dog, 10 stamps; Sunshine, 3 stamps; Ostick & Renne, 3 stamps; Blackhawk, 10 stamps; and Little Butte, 2 stamps. The last two are not operated. All of these work on custom ores except the Yellow Aster and Sunshine mills, which work only ores from their own mines. The Atolia Mining Co. has a 5-ft. Huntington mill which is used only upon tungsten ore (scheelite). In what is known as the Rademacher district, which includes El Paso peaks, Laurel mountain, and the adjacent country on the north, considerable prospecting has been done for a number of years and a little is still carried on, but there has been no output.

Gold Deposits.—Most of the gold deposits of the quadrangle lie in the schist area, along the Rand mountains, reaching their greatest development in the Yellow Aster mine at a place where a granitic intrusion crosses the axis of the range. Along both sides of the range, southwest from Randsburg, are other gold deposits, but those on the northwest side of the range have so far produced very little ore. On the southeast side a number of mines have been and are being profitably worked. There are also a number of mines in the schists within a radius of 1½ miles north and east of Randsburg. Outside of the schists of the Rand mountains the St. Elmo mine, in the granite 5½ miles southeast of Randsburg, has produced some gold. Six miles northeast of Randsburg, at Summit Diggings, a few thousand dollars has been taken from gravels in the sandstones surrounding an intrusive mass of hypersthene hornblende andesite which has locally metamorphosed the sandstone into quartzite. No veins have been found in the vicinity. Scheelite occurs in small amount with the gold ores in a number of the mines in the Rand mountains, and a mile north of St. Elmo, at Atolia, are mines which are probably working the largest and purest scheelite deposits known.

Yellow Aster Mine.—The Yellow Aster was the first lode gold mine discovered in the quadrangle, and for ten years it has been one of the largest gold producers in California. It is at the head of a gulch where a crescent-shaped mass of granite cuts across the mountains. The principal level of the underground workings, known as the Rand level, is 500 ft. below the top of the mountain. The glory hole, from which practically all of the ore mined was being taken at the end of 1909, opens from the gulch 115 ft. above the Rand level. The granite is intrusive in the schists and occurs in many dikes, which show a close relationship petrographically, though there is a wide difference in their general appearance as casually examined, owing to their varying degrees of decay and alteration. The granite in the mine carries biotite and is fine textured. In places the biotite forms irregular segregations from one-fourth to two inches diameter. The feldspars are white, buff, and pink, and in some places where the granite is fine grained there are porphyritic white orthoclase feldspar crystals one-eighth to one-fourth inch in thickness. In places some hornblende has evidently been contained in the granite, its former presence being indicated by aggregations of small particles of magnetite whose general outline corresponds to a cross-section of hornblende. There are also porphyry dikes cutting both granite and schist, but they are older than the orebodies, which pass through them. Where found in the mine, the granite-porphyries are light colored and show little or no mica or hornblende, though it is probable that the lack of biotite is due to its decomposition. The groundmass is of fine-grained orthoclase. The phenocrysts are of microcline and orthoclase with here and there a small quantity of lime feldspar. The granite masses range in thickness from a few inches to several hundred feet. They are evidently branches from a larger body and may come together below. The prevailing dip of the schists on the top of the mountain is nearly flat, but locally the schists lie at all angles and dip in many directions. Similar variations of dip and strike are seen in the mine. The schist is thinly fissile except near the larger granite masses, where it is locally so compact that it is difficult to distinguish from a dark granite. There is a noticeable absence of visible quartz in the mine. The schists contain lenses of white barren quartz.

(To be Continued.)

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Decrease of Value in Ore-Shoots with Depth

The Editor:

Sir—Referring to Oscar H. Hershey's letter on the 'Decrease of Value in Ore-Shoots with Depth,' published in your issue of July 16, 1910, and to J. Parke Channing's remarks upon the same subject in the issue of September 24, 1910. This tendency of mineral veins to decrease in value is well recognized, but has been too often assumed to be a rule. Like the theory of secondary enrichment, it is a hard-ridden hobby of some geologists who, like the rest of mankind, are prone to get ideas in their heads, then try to make nature conform to them. It seems to me as a general thing no one theory accounts for the evolution and development of any class of ore deposits; they are the cumulative result of more than one, perhaps many, diverse forces acting in different ways. There is no reason to suppose ore deposits may not extend as deep as the rocks are fractured, since, except in cases of magmatic segregation, a vein must have a void in which to form, and there must be fractures or fissures to provide channels for the circulation of the metal-bearing solutions. Capillary diffusion, or circulation, of such solutions is probably not an important factor, although one by no means to be ignored. One of the notable features of the day is the constantly recurring reports of discoveries of rich ore at relatively great depths, depths in some cases far beyond regions previously assumed to be unproductive. This increase of depth doctrine is a favorite one with the promoter and faker, hence the conscientious mining engineer cannot be blamed if he be somewhat shy of it; moreover, ore deposits usually have not been found by experience to increase in value with depth beyond the first thousand feet, or thereabout. There are, however, as Mr. Channing observes, exceptions to this rule, the known number of which is becoming more and more numerous. Supposedly exhausted mining districts often exhibit a wonderful vitality, as, for example, Leadville, Colorado. Such facts are indisputable, however much they may be distorted and magnified in tempting an innocent and perverse public to invest in worthless and exhausted properties. By perverse I mean those people who will not employ skillful and honest advisers to examine a property before risking their money in it. This trait seems peculiarly notable in the American public, probably due to its gambling spirit; a propensity that throws common sense to the winds and trusts that miracles will happen! However, this is a dangerous and profitless theme and aside from my subject, for I have long since learned there are many thousands of people who appear to enjoy losing their money in crazy schemes and no amount of preaching will convince them that mining and economic geology are highly specialized technical arts which may be learned only by years of careful study and experience, and even then, unless applied by level-headed men with practical instincts may lead to wrong conclusions. To anyone interested in the subject, I can commend among the many excellent publications upon the subject, a paper recently issued by R. A. F. Penrose, Jr., upon 'Some Causes of Ore-Shoots' (Economic Geology, Vol. V, March 1910). While the facts and observations in this paper are not pretended to be especially new, the deductions from them strike me as being of great value. Thus, upon the subject of 'Deep-Seated Alteration,' Mr. Penrose says: "While superficial influences are altering the upper parts of an ore deposit, deep-seated influences may also be active below. The repeated longitudinal fissuring of a deposit after its formation, * * * may afford new channels for the circulation of new ore-bearing solutions from below, and these may profoundly affect the deposit. They may form new ore in new openings, or add to the ore already existing, or perhaps segregate ore formerly disseminated, in all of which cases ore-shoots may result. Where large bodies of sulphide ores existed in the original deposit, these may be greatly increased by their precipitating action on the new ore-bearing solutions. The new solutions may sometimes carry different metalliferous materials from the older solutions that formed the original deposit, and may thus form new shoots of different ores. * * * In all these processes, however, the result is not always an increase of value or volume of ore, and, as with most factors which influence ore-shoots, there may be no effect at all, or there may be an actual diminution of ore. For instance, when the longitudinal movement along a fissure occurs at only more or less remote intervals, deposition of ore may be increased as just described, but when the movement is very frequent or almost continuous, it is likely to retard deposition or even to prevent it, for deposition progresses best during intervals of repose after dynamic movements. This may be a cause of the fact observed in some mining regions, though by no means in all, that the ore deposits occur in the smaller fissures and not in those that have been the scenes of the greatest amount of movement."

In the concluding paragraphs Mr. Penrose remarks, and I am sure we will all agree with him: "More financially disastrous mistakes have probably been made in mining by supposing that because certain conditions hold good in one region, they must hold good in another, than from any other cause. Every district is a law unto itself in the localization of its ore in shoots, and no district can be properly understood until it has been thoroughly studied *per se*. On the other hand, shoots are not one of those obscure and mysterious phenomena which baffle all efforts at explanation. They are simply the result of natural causes which have been, and are sometimes even yet, active. In almost any district where sufficient mining has been done to permit a thorough examination of the ore deposits, some sort of an idea of the probable cause of the ore-shoot should be obtainable."

It must ever be borne in mind that in the majority of cases ore deposition on a sufficiently large scale to be economically productive is essentially a superficial or vadose process, the depth depending upon the ground-water circulation which varies greatly within relatively narrow limits and has often fluctuated from time to time during the geologic history of any one particular district. The fact of this varied history and genesis cannot be too strongly emphasized. Generally speaking, to no one force or phenomenon can the origin of any one deposit be traced; it is the result of many, acting either simultaneously or in succession. It is difficult in most cases to say where the so-called vadose deposition ceases and something else begins; it seems probable this superficial circulation is often deeper than generally suspected.

F. LYNWOOD GARRISON.

Philadelphia, October 5.

A Tip on Formation

The Editor:

Sir—What is the best formation for copper deposits; some tell me one thing and some another. One miner of large experience—mostly at Butte, Montana, I think—says 'granite' is the thing. Another fellow says 'andesite,' and a third thinks there is nothing equal to 'porphyry' as a copper formation. If there is any real difference I should like to be informed.

PROSPECTOR.

Douglas, Arizona, October 8.

[The formation makes little difference. Prospectors are likely to overlook something of value if they spend their time in searching for some particular formation, such, for instance, as they have been familiar with in other camps. At present monzonite porphyry is considered the best possible formation for copper ores, for the reason that great mines have of late years been developed in that rock, at Bingham, Utah, Ely, Nevada, and elsewhere. The famous mines of Bisbee are, in part at least, in limestone; the Lake Superior mines in amygdaloidal beds and in conglomerate. The Ducktown copper mines of Tennessee are in schist, as are also the famous deposits of Mount Lyell, Tasmania. Many mines now producing copper were in their early history either gold or silver mines. The great mine of the Mountain Copper Co., Shasta county, California, was originally worked as a silver mine, and was at one time equipped with a stamp-mill. The mines of Cerro de Pasco, Peru, were worked many decades for silver. It is only within the past few years that their value as copper producers has been recognized. The lead-silver vein of Broken Hill, New South Wales, Australia, is now producing copper from the lower levels. The formation is schist. The Mount Morgan in Queensland, Australia, has always been considered a gold mine, but it also is now producing copper ore in depth. Many of the large copper deposits of northern Mexico are in andesite. In consideration of these facts we must conclude that copper, like gold, is 'where you find it.'—EDITOR.]

A Question in Converting

The Editor:

Sir—With all the improvements that have been made in the handling of large copper properties and the smelting of the ore or concentrate, little has been done in converter practice other than 'rule of thumb' in determining the depth of the tuyeres below the surface of the matte that gives the highest efficiency for the air blown through the mass. Converting costs are high largely on account of the cost of compressing air to the pressure necessary to overcome the weight of the copper at the tuyeres. Could this head be reduced, blowing costs would be lowered and conversion costs decreased proportionally. There is no doubt that much of the air passes through the matte without its oxygen being utilized, which therefore means a direct loss. I do not believe any scientific work has been done to determine this amount of waste oxygen which so influences the cost sheet. Several attempts have been made to build reverberatories that would both matte and convert the ore in one operation, but these have so far been unsuccessful. Many of the larger companies are now experimenting with the basic lined converter, supplying the necessary silica with the charge rather than having it abstracted from the converter lining and this bids fair to make a slight reduction in operating expenses, but still there is that lack of information on the vital question of the utilization of all the oxygen of all the air that goes into the converter. The companies which are in a financial position to experiment are mostly paying substantial dividends and either do not feel the need of experimenting or do not care to keep up the expense of research work, and the companies that are in need of information of this sort are not in a financial position to carry on the necessarily expensive experiments. If any one of your readers know of any literature on this subject I should be pleased to hear from him.

CONVERTER.

Berkeley, California, October 10.

[Our correspondent has raised an interesting and important question. No literature that has come to our notice discusses the matter of depth of tuyeres in converters.—EDITOR.]

Inhalation of Mineral Dust

The Editor:

Sir—Will some of the many readers of the *Mining and Scientific Press* tell me why it is that the dust from machine drills in dry mines is so quickly fatal to the drill runners, while men may work in dry-crushing mills where the atmosphere is constantly laden with fine dust for years and apparently suffer no evil consequences? I have noticed this fact many times but could never quite satisfy myself as to the very noticeable difference in the effect on the men, for as far as one could judge from appearances, the mill men have much the worst of it, living 8 to 10 hours a day in a cloud of dust so thick that objects 50 feet distant are often invisible.

DRILL RUNNER.

Tuolumne, California, September 24.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

It is good business to have an extra cam-shaft with cams in place in every stamp-mill. It saves much time when one is needed.

Potassium chlorate blasting powders are not new. Moreover, they are extremely dangerous, but withall less effective than nitro powders.

The highest speed that may be safely attained in dropping stamps of the gravity type without 'camming' is about 110. In order to do this the cams must be short and the drop not exceed 5 inches.

The loss of mercury in stamp-milling varies greatly under the differing conditions. Some mill-men consider the loss of 0.1 oz. per ton of ore stamped as excessive, while others think this loss small.

Incandescent electric lights are a cheaper means of illumination in most places around mines and mills, than candles, after the first cost of installation. They are also far more safe, being less likely to cause a fire.

Steel passenger coaches of standard gauge and make weigh 118,500 lb. as compared with 85,000 lb. the weight of the standard vestibuled coach. The steel coaches are found to be far better able to resist the effects of accidents and are less likely to take fire in the event of a wreck.

All steel shapes for structural purposes are made after the specifications of the Association of American Steel Manufacturers when not otherwise specified. To supplement these structural steel standard specifications the association has just adopted by letter ballot a standard specification for reinforcing rods for concrete.

Fine grinding is accomplished in Huntington, Chile, and tube-mills of various design and there appears to be some difference of opinion among millmen as to which machine produces the most satisfactory results. The tube-mill possesses the advantage of making less iron particles by abrasion than the other types of machine.

The dynamite contract for the Panama Canal for the fiscal year 1911 was awarded to the Du Pont de Nemours Powder Co., the amounts and prices being as follows: 45%—8,540,000 lb., at 11.7c.; 60%—5,187,000 lb., at 12.7c. The amounts quoted are estimated as the possible requirements for the fiscal year, but not more than 50% of the estimated amount need be purchased.

Copper in gneiss is by no means an uncommon occurrence. By gneiss is meant rocks of the composition of granite which have a sheeted or laminated structure. Some of the copper mines of the Alleghany mountains are in gneiss. Copper ores occur in gneiss in Gilpin county, Colorado, and elsewhere. Some of the granites and monzonites in which copper occurs abundantly are gneissoid in part.

The speed of winding in mine shafts varies all the way form 100 or 200 ft. per minute to upward of 6000 ft. In small mines the speed usually is about 400 to 500 ft. It is only in the great deep mines that high maximum speeds are attained, and not in all of these. It is considered unsafe to run with men at greater speed than 800 ft. per minute. At such speed the engineer can have the machinery under perfect control.

Pumping by means of windmills is the most economical method of lifting water, but it possesses the disadvantage of sometimes being unavailable when most required by reason of lack of sufficient wind. Where large tanks are provided there is greater assurance of having a supply of water when it is needed than where the storage capacity is small. At some salt-making plants windmills are utilized to pump brine from one basin to another. So far as known windmills have not been successfully employed as a means of power to operate even small quartz mills.

Escape of cyanide solution from the mill is usually confined to that remaining as moisture in the discharged tailing, and that is usually so reduced by the addition of fresh water in sluicing out as to render the solution harmless. In desert regions some danger may arise from solution thus discharged becoming strengthened by evaporation. Where this is the case it would be well wherever possible to collect the water by impounding the tailing, and fencing the pond to keep stock from drinking it. The water in the pond could be pumped back to tanks for re-use in the mill.

The Sargasso Sea owes its existence to the great ocean rivers that encircle it. It is like a vast lake in the centre of the Atlantic, but one whose shores are ever-moving waters instead of stable land. It is like the calm centre of an immense whirlpool. The far-off deep-sea currents that sweep around its circumference do not disturb the stagnant waters within its boundaries. These weed-covered waters are forever placid, except at rare intervals when some vagrant storm swoops down from the heavens and ruffles their surface. The atmosphere above is usually as calm as the seas below. The great rivers of the air, the trade-winds, pass this region by.

To insure the estimated results of engineers in constructing the Hudson River tunnels of the Pennsylvania railroad, a cement-testing laboratory was established at the Manhattan shaft offices, under the charge of a cement inspector who was furnished with assistants for sampling, shipping, and testing cement. All materials used on the work, such as bricks, sand, stone, waterproofing, etc., were tested here, with the exception of metals, which were under the charge of a metal inspector reporting directly to the head office. This department cost about $10,000 for salaries and $3000 for apparatus and supplies, or about $13,000 in all. There were 800,000 bbl. of cement tested, and samples from 2,100,000 bricks.

Special Correspondence

FAIRBANKS, ALASKA

Local Interest in Quartz Development.—Encouraging Ore Showings.—New Machinery.

A significant event in the development around Fairbanks was the excursion taken by a body of business men last Sunday around the creeks to visit and investigate the different quartz properties. Whereas the business men up to date have condemned the lode names the party that tramped the hills last Sunday and picked specimens from the several dumps was fully convinced of the oft-repeated assertion that for the amount of work done, no camp has shown better surface prospects.

An 18-month lease has been taken recently on the Whitman & Murray mine in Skoogy gulch. This mine has a 150-ft. crosscut into the hill with about 100 ft. of drifts along the vein. There is also a 50-ft. winze near the end of the crosscut, but water has caused a temporary abandonment of same. A lower adit is now being driven to drain this winze. The ore from this mine has been milled in Scrafford's arrastre, showing about $40 per ton gross. At the head of Fairbanks creek, McCarty, Zimmerman & Lawson have just opened an exceptionally wide pay shoot on their vein. While not assaying as high as the narrower parts of the vein, it is understood that the showing is entirely satisfactory, and the opening of the ore at this point proves the continuity of the vein for a thousand feet. The Jackson shaft on Cleary summit is down 30 ft., and a good sized body of galena ore is exposed in the bottom. The recent discoveries made by the Cook brothers on the left limit of Fairbanks creek just below the tributary called Too Much Gold creek are showing up as well as the best in the short time they have been opened. The shaft is down only 15 ft., but two assays made on the ore showed $94 and $123 per ton respectively. The vein was 30 in. wide where uncovered, but pinched at the frost line, again widening out when the line of permanent frost was passed. Practically all the veins uncovered in this district show this pinching, and it is generally accepted that it is due to the surface movements caused by change in frost-line. Another vein uncovered by the Cook brothers is two feet wide between well defined walls. The gold here is much finer than in most of the other veins so far discovered, but the value is more even. Hardly a piece of ore can be selected that will not show pay when crushed and panned. Above the Cook brothers, August Hess has uncovered a vein two feet wide that shows free gold in numerous specimens.

After a summer of idleness, the Rhoads-Hall property is again being opened. An air shaft will be sunk and further driving done till the end line of the claim is reached. The main adit is already in 600 ft. and bad air caused the temporary shut-down. Just below this property in the creek bed, Mike Stepovich has just made a clean-up. The moss was removed with mattocks and the quartz float sacked and shipped. In all, 2½ tons was sacked which yielded a $700 bar. Willow creek is at present producing ore at two properties. Buell & Phipps are sacking quartz at the head of the creek from a rich vein, and the Tolovana Mining Co. is storing ore from development. The lease taken by George and Ed Thomas on the lower end of the Spaulding-Clough property and the upper end of the Wild Rose is being actively developed. The shaft is down 40 ft. and though the pay-shoot is narrow, the excellent walls hold out hope for a larger tonnage when the shaft is deeper. It it probable that after the permanent frost-line is reached the vein will be found in its original width. On the upper end of the Spaulding-Clough property a lease has just been taken by Huddleson & Co., who have heretofore been operating placers on Eldorado. A 30-hp. plant will be installed and work commenced in the 60-ft. shaft, where a 3-ft. vein of $50 ore was opened. At the same time, the owners of the claim are prospecting the vein by driving an adit from the lower end toward the shaft. What promises to be one of the largest producers in the camp is the Fredericks property at the head of Vault creek, four miles south of the Spaulding claim and still farther from the properties that first showed good ore. The shaft is down 45 ft. on a 6-ft. vein with an excellent average value. Across Vault creek and on the divide between Vault and Treasure Hoel brothers have located a 16-ft. body of graphitic schist and quartz stringers. This lode seems to be the extension of the Fredericks, being almost in a line with the strike of the latter. F. G. Noyes has lately found a good vein on his claim at the head of Moose creek.

The Pinder concentrator for the Fairbanks test mill has arrived and is installed. In a few days the battery will be raised and the concentrator put to work saving rich concentrate hitherto wasted. Work is progressing rapidly on the 10-stamp Chena custom mill. Another month ought to see the mill in operation. Mr. Cunningham will be in charge. The mill will be complete, all pulp being classified after crushing by a Callow cone, the sand going to vanners and the slime to Deister slime tables.

TORONTO, CANADA

Cobalt Dividends.—Conditions at Kerr Lake. — Elk Lake a Promising Field.—Bullion Theft.

The Cobalt mining situation is improving, owing to favorable reports from several of the mines and the fact that dividends are well maintained. The Nipissing has declared its regular quarterly dividend of 5% with an extra dividend of 2½%. La Rose pays 2% quarterly as usual, the expectations entertained by some that the old rate would be restored this fall having been disappointed, as the directors wisely preferred to accumulate a larger cash reserve before increasing the rate. The Crown Reserve continues to yield the largest returns, paying a 6% quarterly dividend with a 9% bonus. The Right of Way has declared its regular quarterly 2%. A financial statement issued by the Nipissing has materially strengthened the market, showing a surplus on September 17 of cash and ore on the way, or at the smelter, of $1,227,000. Since June 20, the company has paid $750,000 in dividends and increased its surplus by $200,000. Recent developments at the Kerr Lake property indicate that there is little foundation for the fear that its reserves of high-grade ore were becoming depleted. Last month 165,000 oz. of the yield out of a total output of 200,000 oz. were secured from vein No. 7 at a depth of 150 ft. This level has been driven on for 300 ft., leaving 450 ft. more to be opened before the end is reached. This month several small veins branching from No. 7 are being followed. No. 8 is yielding 3000-oz. ore. The Hargraves has come to the front lately as one of the most promising of the newer enterprises. The company has found a vein, supposed to be the rich Kerr Lake vein at the 300-ft. level where it carries 6 in. of good ore. Two new surface veins have been discovered on the Badger each carrying silver. Over 6000 ft. of trenching and stripping has been done on this property during the summer. At the Temiskaming cross-cutting is being done at the 500-ft. level to catch No. 3 vein which is strong at 400 ft. The Crown Reserve will ship no more low-grade ore after October 1, but will turn it all into concentrate. Additions are being made to the Buffalo mill which will double the capacity of the cyanide department, enabling the management to reduce the cost of labor and power by one-half. Operations at Elk Lake and Gowganda are still badly handicapped on account of transportation difficulties. A new wagon-road is being built from Elk Lake to Charlton, on the Temiskaming & Northern Ontario railway, which will provide a good highway for vehicles at all seasons and relieve the situation to some extent, but at latest accounts it was doubtful if the work would be finished before winter. In the meantime only high-grade ore can profitably be shipped and there are large accumulations of low-grade ore throughout the region. Mine managers are anxious for the establishment of one or more custom concentrators. Negotiations are under way for the installation of a concentrator at Elk Lake, and the Reeves-Dobie at Gowganda is getting in concentrating machinery for

a plant of their own. The Big Six property at Elk Lake has been leased for five years by W. R. Mowery on a royalty basis. It carries large quantities of milling ore. Since work was resumed at the Bartlett mine, Gowganda, a 7-in. vein has been found at 8 ft. in a new shaft from which high-grade ore is being taken. About 30 tons of high-grade ore was recently shipped from the Gates property at Gowganda, owned by M. J. O'Brien, being teamed to Elk Lake and forwarded by steamer down the Montreal river. A party of American capitalists comprising Ambrose Monell, J. R. Lamar, and Charles L. Dennison, of New York, recently visited Porcupine and inspected the Dome mine. They found 100 men at work. The mine is equipped with a compressor, two diamond-drills, and a small mill. A large stamp-mill will be installed as soon as transportation facilities render it possible. The Nova Scotia mine, Cobalt, was recently the scene of an audacious robbery. Several of the employees broke open the concrete vault and stole silver bars ready for shipment valued at $17,500. The crime was soon traced to the perpetrators and the plunder recovered. Two of the thieves who confessed were sentenced to five and two years' imprisonment respectively. The Canadian Government's peat plant at Alfred, Ontario, has shipped several hundred tons of peat to Ottawa, where it is being placed on the market at $3.25 per ton, finding ready sale. It is expected that this experiment will act as a stimulus to private enterprises for the supplying of peat fuel. Willet G. Miller, Provincial Geologist of Ontario, has returned from attending the International Geological Congress at Stockholm, Sweden, and will shortly make another inspection of the Porcupine district.

SALT LAKE, UTAH

Utah Copper Co. Production. — Consolidation of Park City Mines. — Daly-Judge.

According to reports the September production of the Utah Copper Co. will be about 7,443,000 lb., a reduction of 1,200,000 lb. from the average of the three preceding months or about 14%. While this curtailment in production is in force work is going on toward developing for a greater production than ever as soon as the market is in better shape. Twenty-one benches have been cut in the side of the mountain at Bingham and eighteen shovels are at work. Three more shovels will be added shortly for developing the ground recently acquired from the Boston Consolidated. To secure ground for the dumping of overburden from the stripping operations the company has purchased Copper Center gulch which insures dump room for some time to come. The conversion of the gulch into a dumping site made necessary the moving of the buildings therein of the Bingham Mines Co. This company has been working its Commercial mine through the lower Commercial adit but this has been abandoned and arrangements have been made with the United States Mining Co. to use the Niagara adit. This will be extended 300 ft. to get under the Commercial orebodies and until this point is reached the mine will be closed. The new outlet brings the mine nearer the main wagon-road and it is expected that the Denver & Rio Grande will build a spur track to the Niagara as soon as shipping is resumed. The Utah Copper Co. has decided to spend about $200,000 for new locomotives to be used on the Bingham & Garfield railroad. These will be Mallet articulated compounds weighing 300 tons each. The Utah Consolidated tramway is now delivering ore to the Tooele smelter at the rate of 100 tons per hour and the plant is treating 600 tons per day of Utah Consolidated ore.

What appears to be the first step in the much talked of Park City merger has been accomplished by the consolidation of the West Quincy and the Thompson. This deal has been pending, off and on, for a number of years but has just been finally consummated. The new company will be called the Thompson-Quincy Consolidated and will have 1,250,000 shares of stock of a par value of $1. Of this issue 75,000 shares go to each of the Daly and the Ontario and 50,000 to the Daly West. In return for these payments of stock the company receives certain privileges including the right to connect its workings with those of the other companies. This means that the Thompson-Quincy will be allowed to connect with the Daly West and drain into it and thence through the Ontario tunnel. Ore will also be transported through the Daly West. It is expected that this merger will be followed shortly by one in which the Daly West will take over the Ontario and Daly properties in exchange for stock. Definite announcement as to terms has not been made and the proposition has not been submitted to the stockholders. The directors of the Daly West voted to pass the usual quarterly dividend as the production of the mine has been materially decreased while extensive development is being carried on. The mine has something less than 200,000 tons of ore proved and this is all on the lowest levels where cost of hoisting is high. The plan is under consideration of building a new mill at the mouth of the Ontario tunnel but if this is done it will probably have a capacity of 600 tons per day and the present

Map of Utah.

condition of the mine does not justify the erection of so large a plant. It is planned to develop thoroughly on the lower levels and prove up a larger tonnage before authorizing the construction of a new mill.

At the Snake Creek tunnel of the Daly-Judge the new ventilating system has been installed and the gasoline locomotive is in use so that the third shift, which was taken off when the air got bad, has been reinstated. The contractors expect to make at least 12 ft. per day from now on. At the mine the Starret pump has unwatered the 1600-ft. level which was submerged for twelve years and ore is now being mined here although all of the workings have not been cleared as yet. It is on this level that the contact occurs between the lime and the quartzite, the formation which has yielded the best ore of the Park City district. The Mammoth was temporarily closed for a few days while some repairs were made to the main working shaft. The material for the repair of the hoisting plant which was seriously damaged about three months ago by a runaway, is on the ground and repairs will be rushed as fast as possible. At the Eagle & Blue Bell the new hoist has been put in operation and only about 85 ft. of sinking remains before the main shaft is connected with the 1000-ft. level. The Victoria company has decided to pay $40,000 cash for the Snowflake group instead of paying for it in stock. It had the option in the matter of payment but decided that the amount called for in stock was too much. The directors of the Emerald have authorized the payment

of the balance due on the one half interest in the Diamond Emerald and Ruby claims. The other half of these claims which is held by a different party is under bond and lease to the Emerald.

DENVER, COLORADO

Strike Situation - Disposal of Coal Lands — Zinc at Leadville — Cripple Creek Activities.

The whole State has experienced an unusually prosperous mining season since early in the spring and with the approach of cold weather the coal mines are adding to the general activity of the industry. The strike in the northern coalfields is, however, still unsettled and trouble seems imminent, in many places between the strike breakers and the union miners. All that is needed is for some over zealous gun man to start the trouble. On August 30 the operators held a meeting and refused to arbitrate their differences with the 3000 striking miners. A letter was sent to Mr. Brake, State Labor Commissioner, stating that there was nothing to arbitrate. This matter seems to have drifted along now far enough to warrant Mr. Brake in compelling arbitration, according to the power given him by the Seventh General Assembly. This is an admirable chance to try the new legislation which has proved so satisfactory in Canada. Lignite is now selling for $5 per ton in Denver, and if a continued cold spell should occur a coal famine would ensue.

The courts have been busy of late with decisions of interest to the mining fraternity. The now celebrated tax case of the Hart Consolidated Mining Co. et al., against the Teller County officials seems to be settled. The suit was brought to reduce the tax and to prevent the county from disposing of the properties involved at tax sale. Years ago when the case started, the plaintiffs secured a temporary injunction, restraining the county from taxing unproductive mines in the Cripple Creek district, on the same basis as producing mines. The temporary injunction has now been made permanent, and some 26 judgments have been obtained against Teller county in favor of the mining companies involved. The amount to be refunded totals $3666 with court costs added. Another decision of equal interest is that handed down by Judges Vandeventer and Lewis, of the Eighth District United States Circuit Court of Appeals. The suit was one for an injunction against Samuel A. Abbey and John J. Lambert, register and receiver, respectively, of the United States Land Office at Pueblo. The plaintiffs were William G. Pested and Charles Beuchat, both of Trinidad, Colorado, who sought to compel the Government officials to deed 240 acres of coal lands in Las Animas county, Colorado, to them at $20 per acre. The Land Office officials refused to sell the land at that price, demanding from $115 to $135 per acre for it, maintaining that this was a reasonable valuation. The Court held, in brief, that a United States court of equity could not interfere in the disposition of matters that, by law and decisions of courts, were conferred upon the Department of the Interior. It also held that the Department of the Interior was not limited to a certain price in disposing of coal lands, but that a reasonable price could be demanded. The decision infers that $20 was the minimum price, and not the maximum price which the act of 1873 intended the Department to accept.

Exaggerated reports have appeared recently in many newspapers about the discovery of immense bodies of high-grade oxidized zinc ores. It is a noteworthy fact that many of these reports omit the third dimension when describing the size of these and other new finds. It is a fact that large reserves of oxidized zinc ore have been brought to notice either by development or by systematic sampling in old stopes in the Hilltop, Robert E. Lee, Maid of Erin, Henrietta, Wolftone, and a few other mines. The ore has been examined very carefully by representatives of the Empire Zinc Co., who state that by careful sorting and sampling the ore can be brought up to shipping grade, and that a large tonnage is available. It is certainly a pleasure to see a new lease of life granted to such a famous old camp as Leadville which has seen the placer miners come and go then its rich lead-silver ores extracted with heavy and vigor. The copper boom followed this, and here the sulphides have gradually decreased in value until the camp has seemed decadent. The peculiar history of a mineral camp illustrates perhaps better than anything else that we are all apt to find just what we are looking for and nothing else.

Cripple Creek is as usual the banner camp of the State with a production of 68,815 tons of a gross bullion value of $1,412,875. The average value per ton of ore shipped was $20.52. The reduced treatment charges on low grade ore put into effect by the American Smelting & Refining Co. on September 26, has been equalled by the Portland Gold Mining Co., and October should see an even larger tonnage of the lower grade ore. Leasing has also been stimulated by this cut in treatment rates. The Deep Drainage tunnel was advanced 342 ft. in September. There still remains about 700 ft. of driving before the main water course will be cut so that early in December this project should be completed. With the drainage problem settled many of the companies will resume the working of their mines on company account, and it seems to be a very fitting time for them all to adopt the change room system as has already been done at the Golden Cycle. The gain to the companies and to the miners does not need any further comment, while the elimination of the ore thieves will be a distinct benefit to the whole district.

MEXICO

Cananea Consolidated.— Cinco Minas. — Alvino Mines. — Huasteca Petroleum Company.

L. D. Ricketts, president and general manager of the Cananea Consolidated Copper Co. (Greene Cananea), names ₱6,500,000 as the total of the expenditures to date for improvements made by the present management for decreasing costs and increasing production at Cananea. It will require several months to complete the construction work now under way, and it is expected that the total will be raised to ₱7,500,000. Concerning present production, which is at the rate of 3,500,000 lb. of copper per month, Mr. Ricketts says: "We have found that, owing to the uncertainties of trade, we could not sell copper as fast as we are producing it, and we therefore decided that it was essential to reduce our production in order to avoid the risk of a lower price for copper, or the necessity of storing it in warehouses until such time as it could be sold. We regard as merely temporary the curtailment, and believe that within six months we can increase our production beyond all previous records. The present capacity of our plant is nearly double that of four years ago." The five-year contract recently entered into by the Cananea Consolidated and the Miami Copper Co. for the smelting of Miami concentrate at Cananea calls for the handling of 100 tons per day. It is expected that deliveries will be started January 1. The contract specifies a rate for smelting, and provides that the gold and silver in the Miami product shall be purchased by the Cananea Consolidated. This contract was secured by Mr. Ricketts in competition with American smelters, notably the Copper Queen, of the Phelps-Dodge interests, and it serves to bring prominently to public notice the great economies effected in smelting operations at Cananea by the Ricketts management. It is the first time in the history of mining and smelting on the continent that an arrangement has been made for the shipment of American ores or mill products into Mexico for treatment.

The legal transfer of the Cinco Minas, famous old producers of the Hostotipaquillo district of Jalisco, to the Cinco Minas Co., organized recently by the Marcus Daly interests with a capital of $500,000, has been made. The mines were purchased early last January by H. E. Crawford, representing the Daly interests, for approximately ₱500,000. The new company is a close corporation, all the stock being held by Mrs. Marcus Daly, her son, Marcus Daly II, her son-in-law, J. W. Gerard, judge of the New York Supreme Court, and Mr. Crawford, who is also a relative of the widow of

the Montana millionaire. The mines were under bond to the Daly interests for a year preceding the purchase, and consequently the development for nearly two years has been under the direction of Mr. Crawford. This development has been attended by very gratifying results, and it is now estimated that, inclusive of the large amount of ore left in the workings by the former owners, the proved supplies of profitable ore total about 500,000 tons. Rich ore has been taken out in the course of new development, and present shipments to the smelter average 70 tons per month. This ore has assays from 5 to 10 kg. silver and 50 to 90 gm. gold. The plans of the Cinco Minas Co. call for the erection of a 250-ton plant, and orders for equipment probably will be placed before the end of the year. The process will be direct cyanidation, stamps and tube-mills being installed for crushing and grinding. Arrangements have been made with the Chapala Hydro-Electric & Irrigation Co., now completing a transmission line into the Hostotipaquillo district, for all power needed at a rate of ₱100 per horse-power year. The Marcus Daly interests are heavily interested in the Banco Central, of Mexico City, and in the El Oro Mining & Railway Co., of El Oro. It is now planned to organize a development company to take up and develop Mexican properties.

At a recent general meeting of stockholders of the Avino Mines, Ltd., held in London, a report covering the 14 months since the resumption of work following a reorganization showed a profit at the mines of £4338 6s. 9d. This profit was obtained from the shipment of hand-sorted ores. The company owns a group of famous old producers about ten miles from Gabriel, a station on the Mexican International, and for years attempts have been made to perfect a satisfactory treatment for the lower-grade ore. Concentration and lixiviation processes have been tried. A test plant for a new process of concentration is now in operation at the mines, and a shipment of ore was recently made to England for tests by another process. At the time of the reorganization of the company it was estimated that the proved ore in the mines amounted to 100,000 tons, and while since that time there has been extracted a total of 43,350 tons, the estimate of proved ore is now 107,505 tons. The ore shipped in the last 14 months has averaged 53s. per ton, and the net return to the company has been only 28 shillings.

The Huasteca Petroleum Co., a subsidiary of the Mexican Petroleum Co., has completed an 8-in. pipe-line from its Juan Casiano field, in the Huasteca district of Veracruz, to the gulf port of Tampico. The new line has a capacity of 25,000 bbl. of oil per day. There are five pumping stations, each one of which cost fully $100,000. Each of the five pumps weighs 110 tons. The oil from the Juan Casiano field is delivered to three 55,000-bbl. steel storage tanks on the bank of the Panuco river. The company recently brought in two gushers, and has five other producing wells. E. L. Doheny, of Los Angeles, is at the head of the enterprises. Plans for the piping of oil to the high central tableland, and, at some future date, possibly, to Mexico City, depend on the development of the Juan Casiano field. If great deposits of oil are proved the plans will be carried out, at least to the extent of delivering oil by pipe-line at some point on the tableland from which it can be easily transported by rail to the Mexican capital. The Doheny interests have been engaged for some time in securing right of way for the projected tableland pipe-line. Huasteca oil is exclusively the fuel of the Mexican National Gas Co., another Doheny concern, which has commenced to supply gas in Mexico City. The Mexican Petroleum Co. is supplying 6000 bbl. of fuel oil per day to the National Railways of Mexico, and is producing asphaltum for use in Mexico and for export to other countries. Since 1906 this company has paid nearly $3,000,000 in dividends.

The Dos Estrellas Mining Co., operating the rich Dos Estrellas mine at El Oro, had a production in August of ₱907,825. The expenses amounted to ₱337,221, leaving a profit for the month of ₱570,604. The August profit of the El Oro Mining & Railway Co. was $95,490, and that of the Mexico Mines of El Oro $77,390. The Choix Consolidated Co., a Los Angeles concern, operating in the Choix district of Sinaloa, has placed an order for the erection of a 100-ton smelter at its properties. A 60-ton hot-blast furnace is to be erected at the Carmen mines near Quilá station, in Sinaloa, recently taken over on a royalty basis by Wilkesbarre men. The properties are owned by the Carmen Mining Co., of San Francisco. Foreign mining men of the Zacatecas district are organizing a miners' association, for mutual benefit and the encouragement of mining investments in that portion of Zacatecas. It is hoped to bring about a revival of mining and milling in this district, at one time one of the most productive of Mexico.

BUTTE, MONTANA

Butte & Superior.—Consolidation of Independent Companies Planned.—Anaconda.

The Butte & Superior company management is confident over the outcome of its bond issue, and there is every reason to believe that the company will not only derive sufficient money to carry its operations on an extensive scale, but will be able in the next 30 days to arrange for the construction of a mill on its property to treat the ore. The company has some payments on property due early in the coming year and the bond issue money will also supply enough to meet those obligations. While there are quite a number of small stockholders selling their holdings, the great majority have subscribed for their pro rata allotment and it is stated that W. A. Clark of this city, former United States Senator, will take up the bonds allowed him under his holdings, indeed there is some reason to believe that he will probably take up a quantity of the bonds left over after the stockholders have received their allowance. The time expires October 20 for subscribing to the bonds so far as the stockholders are concerned.

The report that the independent mining companies are to be merged under one management is beginning to receive considerable attention among people interested in mining. Just what will become of the movement it is yet hard to say, but there is no doubt that at least several of the leading men of the independent companies are in favor of the project, provided satisfactory arrangements can be made. At the present time nothing has been done beyond an informal discussion of the subject between some of the heavy stockholders of several companies. Suits are now pending against two of the leading companies, the Tuolumne and Butte-Ballaklava, brought by the Anaconda and North Butte companies claiming the illegal extraction of ore and mining in ground belonging to the latter concerns. It is therefore not at all probable that anything of a decisive character will be done until there is a decision in the cases mentioned which means probably several months. It is said that the proposed alliance or merger was first proposed by F. Augustus Heinze who stands prepared to put the Davis-Daly into the merger, provided suitable terms can be arranged.

A large force of men are at work constructing the new ore-bins for the St. Lawrence mine to take the place of the ones which collapsed a short time ago, while still another force of men is at work re-timbering the shaft of the mine. The latter work would have to be done in a short time even if the accident to the ore bins had not happened, so advantage is being taken of the close down to do the re-timbering now. This month's output will not show any decrease in consequence of the St. Lawrence being down as the output of other mines has been increased to make up for the 1000 tons per day hoisted by the St. Lawrence company. An effort will be made to have the St. Lawrence ready to resume operations about December 1.

The Washoe Sampling Works, belonging to the Anaconda company which were destroyed by fire a few months ago, are to be rebuilt at once. Since the destruction of the works all the custom ores have been sent direct to Anaconda where they have been treated at the sampler connected with the smelter, but this has been found very inconvenient to the prospectors and small mining people, and the Anaconda company therefore decided to replace the works. The new works will have a capacity of about 1500 tons per day and

will be constructed of reinforced concrete with monolithic concrete and steel beams. The new buildings will cost in the vicinity of $100,000. Work has been commenced on the foundation, and it is expected to have the works ready for operation by March 1. The leading attorneys for the Anaconda Copper Mining Co. have gone to San Francisco to appear before the United States Court of Appeals in the smoke case. This was heard before the United States court of this district more than one year ago and Judge W. H. Hunt after reviewing evidence which had been taken before the master in chancery refused to grant the demand of the Deer Lodge ranchers that an order issue closing the Washoe smelter but did say that there had been a small damage to vegetation which he asked the company to so control as to prevent the alleged poisonous gases from floating through the air and down into the Deer Lodge valley. The ranchers were not satisfied with the decision and took an appeal.

NEW YORK

Granby Report. — Copper Situation. — Oil. — Railroad Building. — Nevada Mines.

The long talked of meeting of the Granby Mining, Smelting & Power Co. was held this week and was replete with sensation. Resignations were in order all along the line and included Jacob Langeloth, the president, who is the largest individual holder in the company. Henry Lee Higginson, George Crawford Clark, George Crawford Clark, Jr., and Payne Whitney. George M. Luther of the Nichols Copper Co., refiners at Laurel Hill, Long Island, was elected president to fill Mr. Langeloth's place. There was some heated discussion concerning the leakage of the facts in Otto Sussmann's report, and after a statement by Mr. Langeloth that neither officials nor directors had any knowledge of the report until after it was printed, a resolution was introduced asking for an investigation of the matter. After some discussion of the situation and of the apparent fact that the Granby was attacked by someone entirely outside of the company the resolution was tabled. That part of Mr. Sussmann's report which tumbled the Granby market about the ears of the unsuspecting shareholders is as follows. "You are, in my opinion, at present confronted with a situation where you have an up-to-date smelter, with a capacity of 4000 tons per day, and a mine the life of which appears to be limited to a few years. Therefore, further steps should be taken toward securing a further alimentation of your smelter from other sources. Your mine management has lately taken an option on some ground north of your own properties, and this is now being explored with drills. Exploration work of outside properties should be pushed vigorously, and at the same time part of the smelting capacity should be used for customs ore." In answer to direct inquiry, Jay P. Graves, general manager, stated that, while drilling operations had been carried on with satisfactory results, such work had not yet reached a point where it is possible to estimate developed tonnage, nor would Mr. Graves attempt to estimate the probable life of the Granby. Part of the smelting capacity is employed on custom work and an effort is to be made to secure additional smelting contracts. The balance sheet shows a deficit of $234,317 for the year; a surplus of $2,464,370; the actual cash and copper on hand is given at $1,012,000. At the British Columbia, the situation is much improved; the Rawhide mine of the New Dominion is in operation, the product being sent to the Greenwood smelter of the British Columbia. The second furnace at the Greenwood smelter has been enlarged and was blown in this week. The entire plant can now handle 2700 tons of ore per day.

The copper situation is marked upon much more hopeful than for some months. The decrease in the visible supply for the month of September is estimated at [illegible] 000 lb. The foreign visible supply is now estimated at [illegible] 250,000 lb. which compares with 250,451,000 on February 1 last when the accumulated surplus reached its high mark. Since that date there has been an uninterrupted shrinkage amounting now to 45,184,040 lb.

The situation in oil is attracting almost as much attention as the now rapidly clearing copper situation did a few months ago. The Shell company of which Sir Marcus Samuel of London, is the head has started a war on the Standard Oil Co. for the European trade. Competition has become so strong that the Shell company is selling its products in the United States, all trade agreements have been declared off and it is said record low figures are likely to be made for all petroleum products. The conditions in oil greatly resemble those governing the copper trade. Consumption is increasing, but production is gaining even faster, and the only saving of the situation lies in sane curtailment and conservation. The Standard's side of the fight for control of the markets of the world is embodied in a recent statement which claims that the lower prices just made are for the purpose of educating people in the uses of refined oil. The Standard says in part: "During the last three years, the world's production of crude oil has been increasing at a rate far in excess of the increase in the world's consumption of kerosene or refined oil. In 1906 the world's production of crude petroleum was 213,000,000 bbl. In 1909 the production was 304,000,000 bbl., an increase of 91,000,000. The increase in the crude oil production in the United States during the same period was 60,000,000 or two-thirds of the entire world's increase. The world's refined oil (kerosene) business in 1906 was 48,000,000 bbl., and in 1909 was 53,000,000, an increase of 5,000,000. These figures show an increase in crude-oil production from 1906 to 1909 of 42½% while consumption of refined oil has increased but 10¼%. While it is true that during the past three years a very large market in the United States has been created for oil as fuel, still stocks are increasing rapidly and at the present time in the United States alone there is held in tankage by the Standard Oil Co. and others a stock of over 115,000,000 barrels."

Montgomery-Shoshone Mine and Mill.

The various railway projects now being carried on by American financiers in foreign countries are growing in importance. The development of the valley of the Euphrates under a concession granted by the Turkish government, is one which recently attracted some attention. Now a group of New York capitalists is undertaking the construction of the Pan-American Transcontinental railway, which is to reach from Colonia northward across Uruguay to San Luiz in the Brazilian State of Rio Grande de Sul, a distance of 420 miles. The people behind the enterprise are the managers and officials of the Isaac G. Johnson Steel Co. of New York. It is stated that about 145 miles of the Cop-

per River railroad in Alaska has been completed, the line extending from Cordova to the Kuskulana river, which is about 50 miles from the Bonanza mines. A tram line has been built from the Bonanza mines to the railroad terminus, the concentrator is nearly completed and will be ready for production by spring. It is claimed that there is about 100,000 tons of copper ore blocked out.

The special meeting of the stockholders of the Montgomery Shoshone Consolidated Mining Co. was held this week and the detailed report presented by the general manager considered. The real question in issue was the continuance of operations and upon the manager's statement that ore supplies are sufficient for about three months' operations, it was decided to continue work until the present ore reserves are exhausted and then close down the property. It is stated that during the past three months there have been several hundred names added to the stockholders' list of the Nevada Consolidated, shareholders now numbering something more than 6000 and being a greater number than in any mining company in the United States, with the exception of the Amalgamated Copper Company.

LONDON

Don Proprietary Mines.—Tin Mining.—Cam & Motor Gold Mining Co. —Amalgamated Secures Option on Ferrobamba Property.

The Don Proprietary Mines has been successfully floated in London without the issue of a prospectus, for the purpose of acquiring the Don, Peggy, and Scouts mines in Rhodesia. The company is registered under local laws and has an office in London. Clement Dixon is consulting engineer, and Thomas J. Gibb is on the London board. The Don mine is eight miles south of Selukwe, Scouts is at Gwelo, and Peggy is farther to the southwest near the Claremont and Nelly mines. At the Don mine, the vein has been traced for 1000 ft. on the surface and a shaft has proved the vein to average 32 dwt. over 22 in. Stoping operations are done at a width of 36 in., and the average content of the ore mined is thus reduced to 19 dwt. A 10-stamp mill and cyanide plant were erected at the beginning of the year and crushing started in May. During July 1200 tons was treated, and the recovery was worth £2600 or 43s. 4d. per ton. The cost of mining and milling was approximately £1000 or 16s. 8d. per ton leaving a profit of 26s. 8d. per ton. Mr. Dixon advises that work should be centred on further development and that in the meantime the mill should run only half time. Less development has been done at the Peggy mine, but the indications are highly favorable and a battery consisting of 7 stamps together with cyanide plant has been erected. The 'probable' ore here is 8500 tons averaging 12½ dwt. over 31 in. The Scouts property has not been fully proved but surface indications are excellent and warrant vigorous development. The nominal capital of the company is £75,000, and of this £20,000 is represented by cash available as working capital; as two of the mines are equipped with reduction and extraction plant the prospects of the company appear to be favorable and promising.

The Tinfields of Northern Nigeria is the name of a company formed by the Champion Gold Reefs of West Africa for the purpose of acquiring two tin-gravel properties in northern Nigeria. One of these is the Federri and is eight miles in extent; 300 acres has been proved to contain a gravel deposit from 2½ to 3½ yd. deep and averaging from 3 to 6 lb. of cassiterite per cubic yard. It is intended to erect a plant to produce 300 tons of cassiterite per year and the cost is estimated at £42 per ton. The second property is the Dila river or Doss, which consists of nine miles of country with a proved area of 400 acres, 3 to 5 yd. deep and averaging 3 lb. per cu. yd. The output is calculated at 500 tons per year at a cost of £40 per ton. L. H. L. Huddart is consulting engineer and C. G. Lush is on the board. The capital of the company is £100,000 of which £70,000 in shares goes as purchase price and £25,000 has been subscribed as working capital. At the above mentioned rate of working the proved areas are expected to last 26 and 23 years respectively.

The Anchor Tin Mining company was formed in London in 1895 to acquire a property at Lottah in the northeast of Tasmania. The property is a stockwork in granite and the tin content is very small. The efficiency of operation is high but the profit has never been great enough to provide a dividend. The company was reconstructed in 1902 and 1909. Bedford McNeill is consulting engineer and James B. Lewis is manager. At the reconstruction in February, 1909, the issued capital was reduced to £25,159 in ordinary shares and £6540 in preference shares, and there are £52,000 of 4½ debentures. During the last 18 months the work at the mine and mill has been suspended twice on account of drought, which Mr. Lewis says has been the most severe in his experience. Consequently the output has been smaller and the cost higher than usual. The ore treated in the 100-stamp mill during the 14 months ended March 31 was 102,283 tons, not much more than half the usual amount, and the average number of stamps running was 66. The black-tin concentrate recovered was 158 tons. This is 3½ lb. of black tin or 2½ lb. metallic tin per ton. The concentrate is smelted at Mount Bischoff and the revenue from the sale during the year was £15,743, less £578 smelting charges. The total cost in Tasmania and London was £17,854 and after adjusting accounts for stocks of tin in hand at the beginning and end of the period, the loss was £1866. Another unfavorable event was a bush fire which destroyed some of the woodwork at the mine and mill. Seeing that the circumstances connected with the drought have been so much against the success of operations the debenture holders have agreed to wait for their interest and the directors for their fees. An agreement has been made with the Tasmanian Government whereby £5000 has been borrowed from public funds for five years for the erection of an aerial cable-way. This is now being constructed. Additional leases have been acquired.

The Cam & Motor Gold Mining Co. has been formed by the London & Rhoedsian Mining & Land Co., which is controlled by Julius Weil & Co., for the purpose of acquiring the Cam & Motor gold mines and other claims in the Gatooma district of southern Rhodesia. Other companies beside that mentioned above have interests in the properties. The capital of the company is £500,000 of which £225,000 in shares and £100,000 in cash goes to the vendors; 225,000 shares are being offered to the public at 27s. 6d. each, the whole issue being underwritten by J. G. Bone & Sons, who have a call on the remaining 50,000 shares. The company therefore starts out with approximately £200,000 in cash for working capital. The Cam & Motor mines have been examined by V. S. Allen, of the firm of Pearse, Kingston & Browne. The geological formation consists of crystalline schists traversed by dikes of varying character. The ore is found in connection with silicious impregnations of the rocks and dikes, and arsenic and antimony are found associated with it. The main lode at the Motor has been proved by two levels, No. 1 being in ore for 685 ft., and No. 2, 280 ft., the average width of the lode being from 4 to 6 ft. and the content 7 dwt. On the main lode at the Cam four levels have been started, and the width is 5 to 6 ft. averaging 14 dwt. At both mines additional lenses and shoots of ore are found, and the orebodies generally are difficult to estimate for both width and content. Mr. Allen figures that 222,000 tons are exposed in the Motor averaging 10½ dwt., and 80,000 tons in the Cam averaging 11½ dwt. He recommends development on a large scale and the provision of extensive plant, mentioning £150,000 as a suitable sum for the purpose.

A. C. Burrage on behalf of the Amalgamated Copper Co., has acquired an option on the property of the Ferrobamba Copper Co. in Peru. Mr. Burrage has purchased outright the remaining unissued shares of Ferrobamba Limited, 3500 in number, at the price of £3 each. He is sending his own representatives to make an examination and he has an option until May 1 of next year to acquire the property for £250,000 in cash and £420,000 in shares in an American company that will have a nominal capital of £1,400,000. The balance of £730,000 will be subscribed by Mr. Burrage and his friends at par to provide working capital. The cash purchase consideration will be paid in yearly installments.

General Mining News

ALASKA

(Special Correspondence) The Mt Andrew Lundin and It mines are the three steady producers in this district That the ore has increased in value with depth seems to be the general report from those properties A 500-ft shaft is being sunk on the Red Wing This property has produced some high grade copper and gold ore and will probably be counted among the producers next year De velopment is going on steadily at the Gold Stream with en couraging results A A Wakefield is in charge The ore is gold, silver and lead The Dall Island Marble Co is send ing a crew of 10 men to commence prospect work on a large deposit of marble on Dall Island Surface indications are favorable and samples from this property have been ex amined by experts and pronounced first class A party of 10 men, headed by J J Martin of the Chicago Explora tion Co, just arrived here from the Unuk river, having made a preliminary examination of the placer ground in the valley This work will be continued next season and if the results are satisfactory dredges will be installed

Ketchikan, October 1

The official report of the Alaska Gold Mining Co for the month ended August 15, is as follows Mill time elapsed 31 days. Ready Bullion mill (120 stamps) ran 30 days, 15 hr., 55 min., water power 21 days, 23 hr., 39 min.; steam power, 8 days, 15 hr., 56 min. 700 mill (100 stamps) ran 30 days, 18 hr., 30 min.; water power 27 days, 1 hr., 30 min.; steam-power 3 days, 17 hr.; ore crushed: Ready Bul lion mill 21,140 tons. 700 mill, 16,926 tons, sulphides saved: Ready Bullion mill 375 tons, 700 mill: 280 tons.

	R. B. mill	700 mill.
Estimated value of free gold	$25,134.69	$23,533.00
Estimated value concentrate	17,450.77	14,588.90
Estimated realizable value	40,087.12	36,206.57
Operating expense	26,023.83	23,097.54
	$14,060.29	$13,109.03
Construction expense	10,961.37	5,326.22
Yield per ton of ore milled	2.01	2.25

Development Ready Bullion claim, 324 ft. in vein on 1650-ft. level; assay value, $2.46; on 1800-ft. level, 188 ft. in ore, value $1.08; in waste, 75 ft.; on 700-ft. claim, on 770-ft. level, 82 ft. in vein; assay value, $1.54; on 1100-ft. level, 44 ft. in vein, assay value $2.90; on 1210-ft. level, 73 ft. in vein, assay value, $2.27; stock of broken ore, Ready Bullion, 8157 tons in 700-ft. claim, 4411 tons.

ARIZONA

COCHISE COUNTY

The Commonwealth Mining & Milling Co. operating near Pearce has completed the new cyanide plant and is treating 125 tons of ore per day. A short time ago the company erected a plant to treat a large pile of tailing that had accumulated from the operation of the mill. A few days after the mill was finished it was destroyed by fire and the present plant has been installed to replace it.——A recent sample taken across the vein at the Gold Queen property assayed $77 per ton.

GILA COUNTY

(Special Correspondence).—The diamond-drill on the 660-ft. level of the Superior & Globe property is 300 ft. below that level and in much better ground for drilling. At or about the 270-ft. mark soft ground was cut which caused much trouble by running and filling the hole. This had to be cemented and re-drilled, which consumed a good deal of time during the month of September. The depth now attained is one-half of that which the hole will ultimately reach.——The development at the Arizona Michigan property for the month of September amounted to 226 ft. Since that time the Black Bird shaft and its two cross-cuts on the 400-ft. level have been discontinued and development concentrated in the Telfair shaft workings.

Miami, October 8.

MARICOPA COUNTY

The Arizona di Borgia group of claims in the Vulture district has been bonded and work will be resumed at once in their development The 50-ft. shaft will be cleaned out and the drifts sampled before any attempt is made to plan new workings The clean up at the old mill on the Vulture mine for September amounted to $6800 The new mill is now handling 100 tons of ore per day

MOHAVE COUNTY

A body of ore has been opened on the 300-ft. level of the Stannose mine of the Arizona Southwestern Copper Co Another carload of mining machinery has arrived in Kingman and is being forwarded to the property of the Frisco Power & Mining Co., where a 100-ton plant is in course of erection The new shaft at the IXL mine is going down rapidly having attained a depth of over 100 ft. It is the intention of the management to continue sinking till the shaft is 100 ft. below the old workings from which a large tonnage of high grade ore has been stoped.

YUMA COUNTY

The shoot on the 200-ft. level of the Paycar group near Rouse has been opened over 50 ft showing a width from 18 to 24 in. and assays of over $200 per ton in gold have been obtained. —After a temporary shut down the smelter of the Clara Consolidated has again been blown in.— Operations have been resumed at the property of the Consolidation Copper Company.

CALIFORNIA

NEVADA COUNTY

At a recent meeting of the board of directors of the Prudential Mining Co. an assessment was levied to raise money to continue unwatering the property. There is still 265 ft. of water in the shaft. It is stated that the present assessment will raise sufficient funds to completely drain the mine and continue the development.——Work has been stopped at the Blue Lead gravel mine near Relief till the winter rains insure an ample supply of water to wash the gravel which is reported to be worth $3 to $4 per car. An 800-ft. adit has been driven through the bedrock and a raise driven to the channel.

SIERRA COUNTY

The people who held the bond on the Sixteen-to-One mine at Alleghany have not made the last payment on the bond and the property has reverted to the original owners who will continue with the development of the mine.——The electric system at the Alaska mine has been completed and the operators will not have to depend on water in the future for their power. The shaft is to be sunk to the 700-ft. level which is 250 ft. below the old workings and drifts driven on the ore from that point.

TUOLUMNE COUNTY

(Special Correspondence).—A discovery of great importance was made at the App property, now owned by the Nevills Investment Co., a few days ago, when two prospectors casually entered the old shaft on the Heslep claim and found uncovered on the 200-ft. level what is thought to be the rich shoot lost many years ago by a French company which at that time was operating the property. It is said samples from across the vein assayed from $13 to $125 per ton. The company, it is understood, will cross-cut from the App shaft to tap the rich body of ore at a depth of about 300 ft. The Heslep claim adjoins the App on the east.——The Gold Ship Mining Co. has at last been granted permission to erect an electric pole-line across a certain part of the Forest Reserve and commenced the long-delayed work a few days ago. The power will be purchased from the Tuolumne Electric Co., whose transmission line passes within two miles of the Gold Ship's property.——Considerable development is to be done at the Spring Gulch group, recently bonded to W. B. McCubbin and George Ash.——The completion of the improvements begun at the Mazeppa mine is being retarded as a result of the Jumper people objecting to the laying of a pipe-line across their land. Among other improvements under way or about to

be commenced is the addition of 10 stamps to the mill.——A 10-in. vein of unusually rich ore has been uncovered in the Experience mine, in the Big Oak Flat district, by William Pool and Frank DeFerrari.——Articles of incorporation of the Columbia Marble Co. have just been filed in this county. The capital stock is $750,000 and the directors are David Hearfield, Edgar T. Zook, and James H. Follis of Marin county, W. T. Barnett of Alameda county, and R. H. Van Norden of San Francisco.——The work of unwatering the Black Oak shaft has not progressed quite satisfactorily, repeated delays having been caused by the breaking of machinery. Nevertheless it is expected that sinking an additional 100 ft. will be commenced soon.

Tuolumne, October 9.

COLORADO

BOULDER COUNTY

A movement is on foot among the mining men of this county to establish a modern cyanide plant at some central point that will treat custom ores. The Boulder County Mining Association co-operating with the Commercial Association is endeavoring to finance the undertaking. It is believed that such a plant would greatly stimulate the production of the county as it would give the owners of small properties a better outlet for their ore.——The Frigid Mining Co. is shipping two carloads of tungsten ore per week to the Eureka mill at Boulder. Arrangements are under way for the installation of a compressor and air-drills.

CLEAR CREEK COUNTY

(Special Correspondence).—Lawson & Co., operating through the Princess of India adit under lease, are shipping a heavy tonnage of ore that is worth $60 per ton silver and lead.——The Key West mine on Leavenworth mountain will shortly be entered among the list of shippers. A streak of ore 8 in. wide is showing in the west drift that is worth $55 per ton gold and silver. E. J. Butts is manager.——The Sprankle property on Covode mountain, has been taken under bond and lease by Frank Straub of Denver. A campaign of development will at once be put under way.——It is reported that work will be resumed during the next few days upon the Bellevue-Hudson mine on Columbia mountain. O. H. Mann, manager for the Southwestern Mines Co., arrived from Boston this week and states that the financial difficulties have been adjudicated.

Georgetown, October 8.

GILPIN COUNTY

(Special Correspondence).—The Pine Comb adit is being driven steadily forward. A vein was recently intersected and a streak of ore 10 in. wide uncovered that is worth $30 per ton gold and silver. E. Shous is manager.——The water is being lifted from the Hubert mine in Nevadaville, and work will soon be put under way sinking the shaft, the object being to connect with the Newhouse adit-level. H. C. Bolsinger is manager.——Work is to be resumed on the Ralls county mine. The shaft will have to be re-timbered from the 500 to the 700-ft. level. It is proposed to sink to a depth of 1000 ft.——Work was put under way last week at the Federal mine. R. Hughes is manager.——Heavy shipments are being made from the Old Town mine by Pike & Co., who are operating under lease. The ore is worth $70 per ton.

Central City, October 10.

LAS ANIMAS COUNTY

An explosion in the mine of the Colorado Iron & Fuel Co. at Starkville entombed 52 men. The property has been classed as a non-gaseous mine and no safety lamps were used, though firing off the solid was not allowed on account of the liability of dust explosions. Connections have been made with the underground workings of the adjoining property and it is probable that a number of the men will be rescued.

SAN JUAN COUNTY

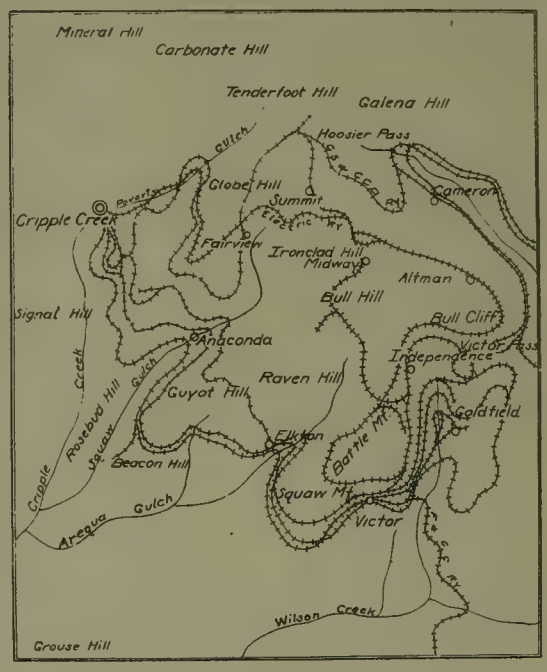
The Bagley adit was the scene of an excellent discovery a few days ago when a large vein of galena ore of milling grade was opened at considerable depth on the Sewall lode. The vein varies from one to four feet in width on the surface from which a number of good assays were obtained before starting the adit that would intersect the lode.

SAN MIGUEL COUNTY

The new mill at the Lewis mine has been started and the machinery adjusted. The Lewis mine is one of the old producers of the county being a heavy shipper for a long time, and it is thought that the construction of the new plant will greatly reduce this expense thereby adding to the company's profits.——The La Junta company has completed a new tram from the Orion mine to the mill.

SUMMIT COUNTY

The Silver King mill in the Montezuma district is again in operation after being thoroughly overhauled and equipped with additional machinery. The stamps are dropping on ore from the Silver Cave, Silver King, and Silver Princess mines, situated on Glacier mountain. Tramways have been built connecting the mill and mines which are old produc-



Map of Cripple Creek District.

ers credited with a heavy production of lead-silver ore.——The Snider Consolidated Mines Co., which is operating the Lightning group on Mineral hill and the St. John group on Mt. Baldy, has opened a quartz vein on the latter group that is over 19 ft. wide and which contains free gold.

TELLER COUNTY

An option has been obtained on one of the local mills in the Cripple Creek district and a canvass is being made of the independent shippers to ascertain if a sufficient supply of ore can be obtained to warrant the establishment of a custom plant.——Shipping ore has been found on the 800-ft. level of the Hoosier mine on Tenderfoot hill which is operated by the Cosmopolitan Mining & Leasing Co., and a consignment will soon be forwarded to one of the local mills.——Millar & Carnduff are sacking ore from their lease in the Conundrum mine on Gold hill. Assays as high as $300 gold per ton have been obtained.

IDAHO

SHOSHONE COUNTY

M. W. Bacon of Butte bought control of the Independence Lead Mines, Ltd., for $5000 at a sheriff's sale in Spokane on October 1. The sale was of 850,000 shares of the stock of the Independence company, which is capitalized at 1,250,000 shares, and was made in pursuance of a judgment for $55,000 obtained by F. Augustus Heinze against Kennedy J. Hanley of Spokane. The Independence company owns a group of partly developed claims between the Morning and

Hunter mines at Montana. It was expected that Mr. Hanson of his friends would appear at the sale and bid the stock up to a price which would at least satisfy the judgment.——A 4-ft. vein of concentrating ore has been exposed in the workings of the Calico Copper Mining Co.'s property situated in the Manson district. J. L. Martin of Spokane president and active manager, says the assays vary from 7% to 9% copper. Since this exposure the drift has been extended 100 ft. in concentrating ore with a 2-ft. streak of shipping grade. This is at a vertical depth of 150 ft.——F. C. Bailey has brought several samples of native silver to Spokane from the Roanoke property, a mile east of the Bunker Hill & Sullivan mine. The ore was taken from the shaft at a depth of 20 ft. and contains lead in addition to the silver.

MICHIGAN

The Ojibway Mining Co. is steadily increasing its underground openings in both shafts and in this work is developing some excellent copper measures. The better showings by far are those obtaining in the north end openings in the No. 1 shaft, where practically all drifts are in mineralized ground. The laterals in the No. 2 shaft are not so encouraging and are for the greater part in a badly shattered formation. The No. 1 shaft is down around 1,330 ft. and the No. 2 is sinking below the 1,550-ft. mark. The shafts are connected at the 800-ft. level.——Shaft sinking on the property of the Houghton Copper Co. has again been resumed after several weeks' idleness during which time the collar of the shaft was lined with concrete. The shaft is down about 60 ft. in the barren trap rock contact. Crosscutting will be necessary to connect with the copper-bearing ground, and the first of these will probably be run at a depth of 150 ft. from surface. Several of the mine buildings are already up and preparations are under way to enclose the shaft collar. All this work is of a permanent character, the results obtained in diamond drilling this part of the Baltic-Superior lode and the excellent showings of copper ground maintained in the Superior mine adjoining indicating a rich though rather small mine will be opened on this property.

NEVADA

CLARK COUNTY

Edwin Carleson ran a 30-ton lot of ore from his lease on the Good Hope through the Cyrus Noble mill in the Searchlight district obtaining a $700 bar. This is the fourth shipment of high-grade ore made from these workings. The shaft has been sunk 70 ft. with a whim on an ore that averages $30 per ton.——A 40-ton lot of $30 ore has been hauled from the Perkins-Kirkeby-Gains lease to the Knight mill. The lessees are stoping from the east on the 100-ft. level about 100 ft. from the shaft.——Knight, Hammil & Colton, who have a lease on the I.X.L. property have opened a new shoot by raising from the old Spink adit. The ore is four feet wide and a shipment will be hauled to the mill within a few days.

ESMERALDA COUNTY

The new 3-compartment shaft on the Florence property at Goldfield has been completed from the 530-ft. level and as soon as the air-pipe can be installed additional drills will be started underground. Two 3-ton skips will be installed and sinking continued to the 750-ft. level.——Combination Fraction is stoping 50 tons of ore per day.—The Consolidated is handling 900 tons of ore per day. The orebody on the 1000-ft. level of the Clermont has been opened about 100 ft., the shoot showing a width of 3 to 15 ft. with an average value of $65 per ton.

HUMBOLDT COUNTY

(Special Correspondence).—The National Mining Co. of Nevada, operating the National mines at National, recently shipped 14 bars of bullion to San Francisco. It is estimated that the approximate value was $95,000. The company also sent out a shipment of tailing, valued at about $45,000, to the smelters. Most of the rich ore came from the old Stall workings, and it was found impossible to save all the gold in the mill, a considerable amount remaining in the tailing. This was dried and shipped to smelters.——The L. M. Edwards lease on May Flower, has opened four inches of bonanza ore. The discovery was made in a 65-ft. winze sunk from the end of a 100-ft. adit. The vein appears to be an entirely new orebody.——The Earl Hyde lease on the north end of the National on Charleston hill has opened a streak of rich ore. This extends the proved ore belt over 1,000 ft. to the north.——An important discovery of stephanite is reported from the Anderson group on Threemile creek, south of Radium Hill.

Winnemucca, October 7.

NYE COUNTY

(Special Correspondence).—While driving a drift through the big vein on the 800-ft. level of MacNamara 12 in. of ore, said to assay $80 per ton, was opened.——The West End Mining Co. is arranging for the installation of a more powerful hoisting plant and will send the shaft deeper. Stoping is under way above the 250- and 400-ft. levels.——The shaft at the Mizpah Extension has attained a depth of 950 ft. and is still in rhyolite. As soon as the 1000-ft. point has been reached lateral work will be commenced.——The new camp of Cedar Corrals, about twenty miles east of Tonopah is attracting some attention, following reports of the discovery of gold-bearing quartz in rhyolite. Several parties of prospectors have gone to the new district from this camp.——The new mill of the Tonopah Liberty Mining Co. at Liberty, near Tonopah, has been completed, and started in full operation on October 2. The plant is operated throughout by electricity, supplied from the main line of the Nevada-California Power Co., and consists of a Blake crusher, Ingersoll-Rand air-compressor, Edgerwood hoist, Chilean mill, tube-mill, Oliver filter, Westinghouse electrical equipment, and Trent mechanical agitators, together with the most modern arrangement of tanks, making a complete all-slimine cyanide plant, with a capacity of 125 tons of ore per day. The company owns 15 full mining claims, with abundant water supply, and has about two miles of underground workings. The stock is held principally by Philadelphians. James G. Lindsay is president of the company. The Traylor Engineering Co. of Allentown designed and built the plant.

STOREY COUNTY

In the C. & C. shaft the pumps have lowered the water 300 ft. below the 2350 ft. and much of the debris has been removed below the 2450 ft. point.—In the Ward shaft the 2475-ft. pump station has been advanced its full width for 100 ft. and all the sills for the station are in place. On the 2100-ft. station the concrete floor to the tank station has been completed and the suction pipes from the pumps to the tank laid.

WHITE PINE COUNTY

The report of E. E. Chase on the Nevada United mines at Ward has been given to the Eastern interests represented by Mr. Chase, and it is reported that attention is again being given to the project of constructing a railroad from Ely to that town. Development has been carried on at these properties for about four years and there is a large tonnage blocked out that will assay between 10 and 15% lead with occasional shoots which contain considerable silver.——The capitalization of the Ely Central Copper Mining Co. has been increased from 1,200,000 shares par value $100 to 1,600,000 shares of the same value.——The Cole-Ryan interests have purchased the Ely holdings of the Gunn Thompson people and it is reported are figuring on erecting a smelter in the Ely district. The properties include a number of valuable claims, townsite, smelter site, and extensive water rights.——A. G. Burritt, manager of the Amalgamated Nevada Mines Co., has purchased the Blackhorse mines in the eastern part of the county for $50,000. A cash payment of $12,000 was made, the balance to be paid by the end of the year.——The Ohuana Mining Co., operating in the Sacramento Pass district, has placed orders for a mill that will treat 30 tons of ore per day. The machinery is to be delivered within the next month.

UTAH

BEAVER COUNTY

(Special Correspondence).—The Star distirct, situated eleven or twelve miles southwest from Milford, has been brought to favorable notice by the development of such properties as the Red Warrior, Burning Moscow, Commonwealth, and that of the Utah Mining, Milling & Transportation Co. In general, the country rock is limestone, the ore occurring in fissures and bedded veins. The Red Warrior was partly developed a good many years ago, but the Red Warrior Mining Co., composed mostly of Duluth operators, came into possession of it in February, 1908; and since that date 96 cars of ore, aggregating 4800 tons, sampling 28% lead, 28% iron, and 14 oz. silver per ton, have been shipped to the smelters. The lead is in carbonate form and the iron is oxidized, the only exception being the occurrence of small isolated bodies of galena. The property is opened by a 500-ft. vertical shaft with levels from the 100, 200, 300, and 500-ft. stations. An 87-ft. cross-cut leads to the ore body from the 100-ft. station; the vein is cut by the shaft at the 200, and is opened by a 130-ft. cross-cut from the 300-ft. station. The deepest level is one of 346 ft. driven from the 500-ft. station, the work in the face of this indicating close proximity to the vein. This work, supplemented by a large amount of driving in ore on the different levels, serves to define the vein as one having a north-south strike, an east dip of 45°, and that within the vein is an ore-shoot which has a continuity of 1100 ft. on a pitch of 30°. While this is not a contact vein, it has some of the characteristics of a contact because the limestone walls are dissimilar. An important part of the development consists of a 150-ft. winze on a 45° incline from the 300-ft. level. A skip is operated on this incline by an air-hoist. Off this winze is a sub-level on the vein and from it a second winze is being sunk. It is proposed to make a raise from the 500-ft. level to a connection with the incline winze from the 300-ft. level to develop ore and establish ventilation. The power for hoisting and driving the air-compressor is supplied by gasoline engines. W. J. Merritt, the superintendent, has been in that position for the last year. He likewise has charge of the development of the Mowitza, an adjoining property, controlled by the same interests that own the Red Warrior. The former has a 670-ft. shaft and some lateral work, but not a great amount of ore.——The Burning Moscow is a well-developed ore-producing mine, situated on the opposite side of a mountain from the Red Warrior, and is considered on the same mineral zone. Mathew Cullen, of Salt Lake, has a controlling interest, and Joseph L. Rawlins is the company's manager. The mine is developed and operated from a 500-ft. vertical shaft, the principal working levels being at 300, 400, 450, and 500 ft. Two winzes are being sunk from the 400-ft. level. The ore consists of lead carbonate and chloride of silver, with a considerable amount of copper carbonate. The work is under direction of Josiah Osborne, who states that 2200 tons of ore has been shipped from the mine since September, 1909.

Milford, October 8.

SUMMIT COUNTY

(Special Correspondence).—The Little Bell Consolidated Mining Co., whose property is situated a short distance south from the Daly-West mine, is shipping 150 tons per month of first-grade ore to the smelters, and is paying dividends. Solon Spiro is general manager, E. L. Talbot is superintendent. A concentrating mill, treating 100 tons per day, will be in operation by October 15. The machinery will be operated by electric power, transmitted from the plant of Knight & Co. on Snake creek. The ore, which is hoisted by steam power from the 800-ft. shaft, consists of lead carbonate, galena, and silver, accompanied by some copper and gold, all in a quartz and limestone gangue. The mill will start on a second-grade dump which probably contains 15,000 to 20,000 tons. The ore first will be reduced to 1-in. size by a 9 by 15-in. Blake crusher, passing thence through a trommel having ¼-in. screens. The sampling will be done by a Cole automatic sampler. The trommel oversize goes to a set of rolls that crush to ¼-in. size. This roll product and the trommel undersize are then elevated to 8 and 12-mesh trommels; the oversize from these passes to two latest pattern Richards' pulsator jigs, the tailing from the latter is ground to 12-mesh by an Allis-Chalmers Chilean mill. The product of the latter and the undersize from the 12-mesh trommel are elevated to a 20-mesh Callow traveling screen; the oversize from the latter is returned to the Chilean mill, and the undersize to a 40-mesh Callow screen. The oversize from the last screen passes to an 8-ft. Callow settling tank, in which the pulp is thickened and concentrated over a Wilfley table; the undersize from the same screen goes to a 5-spigot Janney mechanical classifier. The material from the first two spigots flows to two 8-ft. Callow tanks, and is then concentrated by a Wilfley table. Material from the other three spigots, consisting of the finer sand, goes to three Callow settling tanks, the heavy material passing to three Card tables. The overflow from the Janney classifiers is thickened in a Callow tank and concentrated over a 6-ft. Frue vanner. The middling from all the tables is elevated to the Chilean mill for re-grinding. The concentrate product is to be laundered into an 80-ton, 2-compartment bin, in which it is dewatered before being hauled to the railroad. Rush T. Sill, who has charge of the mill, estimates that the ratio of concentration will be about 6 into 1.

Park City, October 8.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—Sixty per cent of the purchase price has now been paid upon the large group of mineral properties and smelter at Nelson, recently consolidated and bought by the associates of R. S. Lennie. It is the desire of the capitalists interested to own the property outright and the remaining 40% will be paid within the next six months. Work will be commenced as soon as the engineers have finished their examination of the property and it is known where this can be most expeditiously carried on. A large working force will be employed when the enterprise gets under full sway and the Nelson smelter will be refitted and blown in.——The mineral display at the Nelson fair this year was the best that has ever been seen there. The Nicola, Rossland, Portland Canal, McGillivray, Sandon, Lardeau, Poplar Creek, Ainsworth, Sheep Creek, Ymir, Bayonne, Nelson, and other mining districts were fitly represented. The Nicola Valley exhibit took first prize. The display comprised copper ore, native copper, gold-copper, bornite, chalcocite, hematite, semi-bituminous coal, fossil coal, galena, and gypsum. The Rossland display was a close second, showing representative gold-copper, gold ore, gold-copper-silver, sulphide of silver and copper, gold, galena, and zinc ore. The exhibit of gold-bearing ores from Nelson district was highly commended, as was the silver-lead display from the Slocan-Ainsworth district. ——The air-compressor for the Yankee Girl Gold Mines, Ltd., has now been delivered and the work of getting it in position will be hurried through as rapidly as possible. This machine will have a capacity of over 550 cu. ft. per min. ——The second payment has been made on the Clyde-Belt bond, Sheep creek. A new 400-ft. adit is being driven to intersect the main vein. This property is on the same hill as the Nugget and Mother Lode mines. The management of the Mother Lode mine is contemplating the erection of a concentrator next spring. This will be built on Sheep creek, below the mine.——The old Enterprise mine on Tenmile creek, Slocan lake, has been leased by S. S. Fowler, Nelson, and a new drift has been started on the vein.—— About 40 tons of rich ore is ready for shipment at the Panama mine in the Kaslo district.——The Spitzee Mining Co. of this city has decided to do some development on the outcrop at the Derby claim.——The August report of the Van-Roi Mining Co., of Rossland, operating the mine of that name at Silverton, indicates that recent development of the Beryl vein has resulted in it opening in a promising manner on the fourth level for 360 ft. Average width 4 ft. 2 in., average assay 16.68 oz. silver, 6.5% lead, 11.8% zinc. The lease of the Wakefield mill having expired August 15,

the company is now building its own concentrator. The Geological Survey of Canada has commenced the preliminary work of a survey of Franklin and copper camps. O. E. Le Roy and party are now on the ground. Upon the result of this survey will depend a lot of proposed development.

Rossland, October 8.

ONTARIO

The following table shows the mines, number of cars and total tonnage of ore shipped during September:

Mine	Cars	High	Tons
Nipissing	19	1	648
La Rose	6	.	234
Crown Reserve	7	2	224
Kerr Lake	7		210
McKinley	8	8	198
Coniagas	4	4	124
Buffalo	4	4	119
Temiskaming	3	2	101
Chambers Ferland	3	3	96
Hargreaves	2		60
Standard	2	2	55
O'Brien	2	2	53
Trethewey	2	1	42
Right of Way	1		41
City of Cobalt	1	1	33
Townsite	1		32
Silver Cliff	1	1	28
Colonial	1		23
Beaver	1	1	23
King Edward	1	1	21
Total	76	35	2,371

The recent discovery in the Little Nipissing property in the Cobalt district bids fair to exceed all expectations, as the last round of shots opened a 15-in. pay shoot in the 3-ft.

McKinley-Darragh Shaft.

vein.——At the eighth annual meeting of the stockholders of the Tamiskaming & Hudson's Bay Mining Co. the directors reported that a 20-stamp mill was being erected on the property and that the management was still trying to secure additional claims in new districts. The financial statement showed that over $500,000 had been received from sales of ore and that the outlook for the present year was excellent. The same board of directors was elected.——The diamond-drill on the Dome property at Porcupine is reported to have reached a depth of 500 ft. and the management is to install a drill with a larger capacity as the present showing is said to be excellent.——Twenty-one Cobalt mines shipped 2371 tons of ore during September, as compared with 2238 tons for August. Out of a total of 76 cars, 35 contained high-grade ore. During the corresponding period last year 16 mines shipped 67 cars, of which 31 contained high-grade ore, comprising a total of 2153 tons. Rich shipments from McKinley-Darragh, Coniagas, Buffalo, Chambers-Ferland, and Temiskaming constitute the interesting features of the Cobalt camp for September. The appearance of Temiskaming and Beaver among the shippers of high-grade ore has given an added interest to mining in the south end of Coleman. Temiskaming where from the 400-ft. level is sunk in ore so rich that it cannot be broken.

MEXICO

CHIHUAHUA

The first unit of the Palmilla Mining Co.'s new mill at Parral is rapidly nearing completion and will be in operation before the first of the year. The plant when completed will consist of three units and handle 1000 tons of ore per day, treating custom ore as well as that from the company's properties.——The Tajo of Parral is producing about 4500 tons of gold-silver lead ore per month and shipping approximately three-fourths of this amount.——The Parral Consolidated Mines Co. has started its 30-ton mill at the Prieta mine.——The 30-day run at the new mill of the Yoquivo Development Co., operating in the Rayon district, proved successful and the plant is in steady operation. The company is also shipping high-grade ore.

HIDALGO

The new owners of the Potosina mine in the Pachuca district who commenced work on the property last spring have cleaned out the old shaft, and the adit which was driven 200 metres to connect with the shaft for ventilation, and are to start sinking. A good shoot has been opened and it is the intention of the operators to commence blocking out the ore at once.

SONORA

It is reported that unless the Southern Pacific soon makes arrangements for the completion of its line on the Yaqui river the owners of the properties in the Tigre and Tabatalochi districts will combine forces to erect a central reduction plant.

PHILIPPINE ISLANDS

Near Ragay gulf on the Pacific side of Luzon island, a new mining district has been discovered, and is being developed. As usual in gold regions, the placers were the first to attract attention, and a company, known as the Ragay Gulf Exploration Co., has been organized to exploit the gold-bearing alluvials, probably by dredging. It is reported that bore-holes made for the company in prospecting showed the gravel to contain from 84 cv. to ₱2 per cubic yard. In addition to the placers the company owns a number of veins carrying copper. Coal has also been discovered and locations made. The Stanley dredge was busy throughout June and recovered 140 oz. of gold. Low-grade ground is being dredged. Better gravel is known to lie beyond. The Paracale Gold Dredging Co. has temporarily suspended operations, pending the completion of a new dredge, which is about finished. The quartz mill bought by this company has arrived. Johnson and Carman have secured for American capital several thousand acres of placer ground in Nueva Ecija. Engineers are expected to soon outline a plan of operations. The Tellus company has allowed its option on the Mancayan copper property to expire, in consequence of which the Lepanto Mining Co. will reorganize to equip and operate these mines, which are the largest known at present in the Far East.

A vein over 20 ft. wide assaying $10 to $25 gold per ton has been cut on the property of the Headquarters Mining Co. in the Benguet district. All the machinery for the mill is on the ground and construction is to be started at an early date. The plant is to be completed by next April or May.——Good reports have been received regarding the development at the Navotas and Malapayunang groups at Mambulao near Paracale.——G. I. Adams, geologist of the Division of Mines, has resigned and will engage in consultation work in the Islands.——The Secretary of War has decided that the work on the Government coal mines at Batan shall be suspended unless Congress makes an additional appropriation.——A 3-ton shipment of high-grade ore has been taken from the Little Wonder mine. This is to be forwarded to San Francisco for treatment.

Company Reports

MONTANA-TONOPAH MINING COMPANY

The annual statement of the Montana-Tonopah Mining Co. for the fiscal year ended August 31, 1910, shows a total of 50,245 tons mined and milled of an average assay value of $15.22. The total receipts per ton were $12.94, and the total expenditures per ton were $10.26, leaving a profit of $2.68 per ton, or a total yearly profit of $134,715.40. The expenditure of $10.26 per ton is subdivided as follows: mining, $3.41; development, $1.81; milling, $3.73; general maintenance, indirect charges, etc., $1.31. The energetic management of the company is indicated by the showing of 10,681 ft. of development. The cost per foot of this work, exclusive of compressed air and general charges was driving $6.24, cross-cutting $5.83, raising $5.10, and sinking $14.43. Of the development 42% is classed as 'development on possible milling ore. The 40-stamp mill averaged 38½ stamps, with a daily tonnage of 3.67 tons per stamp. The average value of the mill tailing was $1.43 per ton, giving a gross extraction of 90.8%—a gold extraction of approximately 93% and silver 90%. Of this extraction 37½% was in the form of concentrate and 62½% in bullion. The average fineness of the bullion was 11.6 in gold and 890.6 in silver. The concentration ratio was 50 tons to 1. The milling costs for the last six months were but $3.37, due to the previous repairing and overhauling of the Butters filters and the increased efficiency under the new superintendent, B. A. Bosqui. Within the year the company began purchasing its water from the Tonopah Mining Co., being water pumped from the Mizpah shaft and entirely suitable for milling purposes. In comparison with the previous year the profits are slightly larger. The grade of the ore has been better, but mining and development costs have shown an increase. Milling costs showed a slight reduction, mainly in the item of power, due to the avoidance of excessive 'peaks.' As a whole, the creditable showing for the past year is due to Edgar A. Collins, superintendent, and to W. B. Alexander, the secretary-treasurer of the company, who makes his office at the mine.

ORIENTAL CON. MINING COMPANY

The report of the Oriental Con. Mining Co., operating in Korea, for the year ended June 30, 1910, shows that total receipts for the year were $1,434,494.86; operating costs were $780,258.83; profit, $654,236.03; put back into new construction, development work, etc., $30,559.08, leaving net receipts for the year $623,679.94. The statement is made by Alf. Welhaven, the general manager, that the average value of the ore was somewhat lower than during the previous year, the increase in net profit of $67,307.20 being due to increased tonnage, smaller construction expense, and lower cost of mining. Seven mines were operated, the total tonnage being $319,885, from these mines, to which 822 tons was added, being the product of several tribute mines. Mining cost was $1.415 per ton, which includes all underground development during the year. This cost was 17.5c. per ton less than the previous year. The total footage driven was 27,189 ft. There was a total of 240 stamps operated during 325 days 13 hours and 34 minutes. The duty per stamp was 4.3 tons. Total ore reserves are estimated at 838,250 tons, valued at $3,948,475. This shows an increase in ore reserves for the first time since 1904. The company distributed as a bonus to white employees on Christmas Day, 1909, $10,000, this being the fifth annual distribution of this character. The report is, as usual, given in detail, leaving little to the imagination of stockholders. Among notable features of the company's operations during the year were the fact that less money was put back into construction than in previous years; the operating expenses were 28.5c. per ton less than during the previous year; the development footage was the largest in the history of the company; ore reserves were increased, and ten stamps were added to one of the mills. It is expected that the tonnage mined and crushed this year will be larger than ever before.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

SUFFICIENCY OF LOCATION NOTICE

A notice of the location of a mine is sufficient whereby any reasonable constructions, in view of the surrounding circumstances, the language employed in the description will impart notice to subsequent locators.

Snowy Peak Mining Co. *v.* Tamarack & Chesapeake Mining Co., (Idaho) 107 Pac. 60, Feb. '10.

ASSIGNMENT OF MINING LEASE

A provision in a mining lease requiring the approval of the lessor to any assignment cannot affect the liability of an assignee for the expenses of operating the mine where the lease was delivered to him, as he must have contracted in reference to such stipulation.

Hummer *v.* McGee, (Wis.) 124 Northwest. 302, Jan. '10.

ADVERSE SUIT—RECOVERY

The plaintiff in an adverse suit must recover upon the strength of his own title, and not by reason of the weakness of the title of the applicant for patent; and the fact that a third person has made a subsequent location of all or of part of the territory covered by the location for which the patent is sought will not avail the plaintiff in such adverse suit, not based upon such subsequent location.

Snowy Peak Mining Co. *v.* Tamarack & Chesapeake Mining Co., (Idaho) 107 Pac. 60, Feb. '10.

CONSTRUCTION OF LOCATION CERTIFICATE

A location certificate using the word 'location shaft' instead of 'discovery shaft' in giving the length of the claim in each direction, while the point from which the length was measured in the certificate of an enjoining claim was designated as the 'location,' was construed as intending to give the length each way from the centre of the discovery shaft as required by the statute, and that the 'location shaft' in one certificate and a 'location' in the other referred to the discovery shaft.

Bergquist *v.* W. Virginia-Wyoming Copper Co., (Wyo.) 106 Pac. 673, Feb. '10.

FORFEITURE OF MINING CLAIM—FAILURE TO PERFORM ASSESSMENT WORK

A forfeiture of a mining claim does not take place by the mere failure of the locators to perform the assessment work for any particular year. But to complete the forfeiture there must have been a re-location of such ground before any resumption of the assessment work takes place, as the right of the original locator is terminated only by the entry of a new location, and resumption of work prior to the lawful inception of an intervening right prevents forfeiture.

Snowy Peak Mining Co. *v.* Tamarack & Chesapeake Mining Co., (Idaho) 107 Pac. 60, Feb. '10.

LEASE OF MINE—FORFEITURE

A lease of a coal mine provided for its forfeiture for non-payment of rent. The lessee after operating the mine failed to pay the stipulated rent and the lessor brought an action to forfeit the lease. On proof that the lessee was insolvent and it appeared doubtful whether the mine developed by the lessee at a large expense could be so operated as to pay the rent, and where it appeared also that liens were asserted against the property, a court of equity properly terminated the lease in favor of the lessor, notwithstanding the rule that equity will relieve against forfeitures when circumstances justified.

Wender Blue Gem Coal Co. *v.* Louisville Property Co., (Ky.) 125 Southwest. 732, Mar. '10.

Personal

Professor [illegible] will be found in the [illegible] Mines and Engineering Building, San Francisco.

Algernon Del Mar is in San Francisco.

L. A. Ives of Salt Lake was in Humboldt county, Nevada, last week.

P. O. Vecki has returned from a vacation at the Hawaiian Islands.

Scott Turner was in San Francisco on his way from Angels to Mammoth.

Oscar Lachmund, formerly of Salt Lake, is now at Alamos, Sonora, Mexico.

C. L. Collins has gone to Arizona to examine the Oro mine near Crown King.

Charles Janin has gone to Plumas county, California, on professional business.

Arthur L. Pearse was in San Francisco this week, and will return to London at the end of this month.

E. R. Buckley has gone to southern Idaho where he will be for a couple of weeks before returning to Rolla, Missouri.

O. Overstrom, consulting engineer for the Calaveras Copper Co., has been in San Francisco on his way to Copperopolis.

F. Curtis is in San Francisco from Smelter, Nevada, where he has charge of sampling and experimental work in the Steptoe concentrator.

William R. Jewell passed through San Francisco on his way to Bakersfield, from Plumas county, where he has been examining placer mining property.

S. E. Bretherton was at the Afterthought mines, Ingot, this week, and will be at the Dominion Gold Mines, in Plumas county, California, next week until the 25th on professional business.

J. A. Holmes, the Director of the United States Bureau of Mines, was given a compliment dinner at the Palace Hotel, October 6, by the San Francisco Section of the Mining and Metallurgical Society of America. Among those present were J. A. Holmes, S. B. Christy, R. W. Brock, F. G. Cottrell, G. S. Rice, S. E. Bretherton, E. H. Benjamin, R. S. Rainsford, E. A. Collins, J. R. Farrell, R. C. Shaw, C. C. Brayton, J. W. Malcolmson, L. M. Mills, Gelasio Caetani, A. E. Montgomery, Ralph Arnold, H. F. Bain, E. T. Blake, Sumner S. Smith, A. C. Lawson, Herman Zadig, Francis Drake, E. C. Hutchinson, T. A. O'Donnell, M. L. Requa, Alfred von der Ropp, J. H. Mackenzie, F. W. Bradley, C. C. Derby, Chas. G. Yale, C. H. Lindley.

OBITUARY

J. W. Miller, who was among those killed in the wreck on the Illinois Traction System near Staunton, October 4, was general manager for the Superior Coal Co., having mines near Gillespie, Illinois, and one of the best known operators in the Middle West. Mr. Miller served several years as State Mine Inspector in Iowa, resigning to enter the service of the Consolidated Coal Co., affiliated with the Chicago & Northwestern railroad. When the Superior Coal Co. was organized in Illinois to furnish coal to that railway, Mr. Miller was placed in charge. Here he did remarkable work, sinking shaft No. 1, 350 ft., opening the mine, and hoisting 3000 tons of coal in 8 hours, all within a year of breaking ground. Later at mine No. 3 he hoisted 3619 tons in one shift, and on the same day took 3601 tons from shaft No. 2. Mr. Miller found time for public service as well as for his private work, being one of the influential members of the Illinois Coal Operators' Association and having been appointed this year on the State commission to organize mine-rescue work. For this position he was peculiarly well fitted, since he had to an unusual degree the confidence of operators, miners, and inspectors. His death is a loss to the State and the industry as well as to his friends and the company for which he worked.

Market Reports

LOCAL METAL PRICES

San Francisco, October 13

Antimony	12–12½c	Quicksilver flask	48
Electrolytic Copper	14½–15c	Spelter	7 1/4c
Pig Lead	4.70–4.75c	Tin	37½–38

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead	Spelter	Silver per oz
Oct. 6	12.62	4.40	5.54	54⅛
" 7	12.50	4.40	5.54	54
" 8	12.50	4.40	5.54	54⅛
" 9	Sunday	No market		
" 10	12.50	4.40	5.54	54⅛
" 11	12.50	4.40	5.54	54
" 12	Holiday.	No market		

ANGLO-AMERICAN SHARES

Cabled from London

	Oct. 6. £ s. d.	Oct. 13 £ s. d.
Camp Bird	1 11 9	1 11 9
El Oro	1 7 6	1 7
Esperanza	2 8 1½	2 8
Dolores	1 5 0	1 5
Oroville Dredging	0 7 0	0 7
Mexico Mines	7 17 6	7 16
Tomboy	0 16 6	0 17 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Oct. 13.		Closing prices Oct. 13
Adventure	$ 8	Mohawk	$ 49
Allouez	41	North Butte	32¼
Atlantic	5	Old Dominion	30⅜
Calumet & Arizona	60	Osceola	128
Calumet & Hecla	550	Parrot	13¼
Centennial	20⅛	Santa Fe	1⅝
Copper Range	68	Shannon	11⅜
Daly West	5	Superior & Pittsburg	23⅛
Franklin	11⅝	Tamarack	68
Granby	30	Trinity	32⅞
Greene-Cananea, ctf	7⅛	Utah Con	20¼
Isle-Royale	23	Victoria	2¼
La Salle	10⅛	Winona	9⅜
Mass Copper	10¼	Wolverine	125

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Oct. 13.		Closing prices Oct. 13.
Amalgamated Copper	$ 67⅝	Miami Copper	$ 19⅜
A. S. & R. Co	71¾	Mines Co. of America	⅛
Braden Copper	4⅜	Montgomery-Shoshone	⅛
B. C. Copper Co	7	Nevada Con	20⅛
Butte Coalition	19⅝	Nevada Utah	⅛
Chino	19¼	Nipissing	10⅛
Davis Daly	2	Ohio Copper	1⅞
Dolores	5½	Ray Central	14⅛
El Rayo	3½	Ray Con	19⅜
Ely Central	¼	South Utah	1⅞
First National	3⅞	Superior & Pittsburg	12⅞
Giroux	5⅜	Tenn. Copper	30⅜
Guanajuato Con	⅛	Trinity	5¼
Inspiration	9⅞	Tuolumne Copper	3¾
Kerr Lake	6⅜	United Copper	4½
La Rose	3⅞	Utah Copper	59⅛
Mason Valley	9⅜	Yukon Gold	3⅞

SOUTHERN NEVADA STOCKS.

San Francisco, October 13.

Atlanta	$ 13	Mayflower	$ 6
Belmont	4.00	Midway	22
Booth	10	Montana Tonopah	96
Columbia Mtn	4	Nevada Hills	2.30
Combination Fraction	31	Pittsburg Silver Peak	50
Daisy	3	Rawhide Coalition	6
Fairview Eagle	40	Rawhide Queen	—
Florence	2.17	Round Mountain	44
Goldfield Con	8.05	Sandstorm	4
Gold Kewenas	7	Silver Pick	7
Great Bend	3	St. Ives	18
Jim Butler	29	Tonopah Extension	1.05
Jumbo Extension	26	Tonopah of Nevada	8.50
MacNamara	29	West End	50

(By courtesy of San Francisco Stock Exchange.)

OIL DIVIDENDS FOR AUGUST, 1910.

From the Official Monthly Statement of Oil Securities of the San Francisco Stock Exchange.

Company.	Capital.	Shares issued.	Par value.	Acreage.	Location.	Dividend. Last date.	Amount per share.	Total to date.
Alma Oil Co	$400,000	380,000	$1.00	120	Kern River	7 15 '10	$ 3	$182,400.00
Amalgamated Oil Co	5,000,000	50,000	100.00	*	Salt Lake Field, L. A	9 15 '10	1.00	1,600,000.00
Amer. Petroleum (pfd.)	2,500,000	25,000	1.00	*	Coalinga and Sherman	9 1 '10	66	273,649.05
Apollo	500,000	200,000	2.50	40	Kern River	8 20 '10	1	4,000.00
Associated Oil Stock	40,000,000	400,000	100.00	*	Kern, Coalinga, McKittrick	8 1 '07	1.50	1,548,368.54
Associated Oil Bonds 5s	3,006,000	.....	....	*	Kern, Coalinga, McKittrick	.....	....	.....
Bay City	500,000	100,000	5.00	200	Midway	8 15 '10	10	145,000.00
Blue Moon	200,000	189,759	1.00	20	Coalinga	.....	....	.....
Brookshire	500,000	500,000	1.00	933	Santa Maria and Midway	1 1 '10	1	442,500.00
California Midway	1,000,000	922,800	1.00	160	Midway	.....	....	.....
California Oil & Gas	1,000,000	900,000	1.00	[illegible]	Coalinga	.....	....	.....
Caribou Oil & Mining Co.	100,000	80,703	1.00	100	Coalinga	9 15 '10	25	821,586.24
Chicago Crude	1,000,000	1,000,000	1.00	100	Kern	3 25 '07	0½	15,000.00
Claremont	500,000	500,000	1.00	280	Kern and Coalinga	9 28 '10	2	385,000.00
Coalinga Central	500,000	450,000	1.00	120	Coalinga	.....	....	.....
Coalinga Pacific	165,000	65,000	1.00	40	Coalinga	12 23 '09	10	107,250.00
Columbia	1,000,000	999,226	1.00	*	Fullerton and Whittier	9 25 '10	½-½	334,752.59
Cresceus	320,000	320,000	1.00	40	Midway	.....	....	.....
Dabney	1,000,000	1,000,000	1.00	120	Midway	.....	....	.....
Del Rey	1,000,000	785,490	1.00	40	Kern River	[illegible] 1 '10	0½	19,637.50
De Luxe	100,000	100,000	1.00	40	Coalinga	.....	....	.....
Eldorado	100,000	100,000	1.00	10	Kern River	8 31 '10	1	.....
Empire	200,000	200,000	1.00	80	Coalinga	9 30 '10	1	10,000.00
Enos	500,000	358,500	1.00	220	Kern and Santa Barbara	.....	....	.....
Esperanze	160,000	160,000	1.00	170	Coalinga	12 27 '09	9	49,450.00
Euclid	350,000	350,000	1.00	10	Kern and Coalinga	8 1 '10	1	141,500.00
Four Oil	300,000	300,000	1.00	20	Kern and Coalinga	2 25 '10	1	213,000.00
Fulton	1,000,000	100,000	10.00	120	Sunset	.....	....	.....
Globe	600,000	600,000	1.00	20	Kern River	4 1 '10	1	87,000.00
Graciosa	1,000,000	1,000,000	1.00	*	Santa Maria	.....	....	.....
Home	100,000	100,000	1.00	140	Coalinga	9 20 '10	2	486,000.00
Homestake	100,000	10,000	10.00	160	Coalinga	7 15 '10	10	79,250.00
Illinois Crude	200,000	200,000	1.00	10	Kern River	6 1 '10	1	94,000.00
Imperial	500,000	100,000	5.00	2,480	Kern and Coalinga	7 18 '10	8.00	4,000,000.00
Junction	250,000	250,000	1.00	80	Kern River	6 1 '09	1	20,000.00
Kern River	100,000	20,000	5.00	[illegible]	Kern River	9 1 '10	10	112,000.00
Linda Vista	.....	385,850	....	20	Kern River	8 5 '10	1	80,608.50
Lucile	50,000	26,704	1.00	40	Coalinga	12 20 '09	10	42,727.04
Mascot	500,000	500,000	1.00	225	Midway	9 20 '10	2	50,000.00
McKittrick	500,000	500,000	1.00	1,200	McKittrick	.....	....	.....
Mecca	500,000	422,500	1.00	120	Kern River	7 15 '09	3	71,825.00
Midway of Oregon	1,000,000	1,000,000	1.00	640	Midway	.....	....	.....
Monte Cristo	500,000	500,000	1.00	80	Kern and Maricopa	9 20 '10	10	690,000.00
Mountain Girl	350,000	350,000	1.00	*	Midway	8 4 '10	2	7,000.00
Mexican Petroleum	50,000,000	10,000,000	5.00	*	Mexico	9 1 '10	1⅓	3,499,500.69
M. & M	1,000,000	1,000,000	1.00	140	Maricopa	.....	....	.....
Nevada County	250,000	250,000	1.00	30	Kern River	10 13 '08	4	40,000.00
New Penn. Petroleum	500,000	500,000	1.00	147	Santa Maria	9 15 '10	1	20,000.00
Palmer	2,000,000	1,802,010	1.00	880	Santa Maria	9 25 '10	1	358,481.20
Paraffine	300,000	300,000	1.00	40	Midway	9 15 '10	1	33,000.00
Peerless	1,000,000	100,000	10.00	160	Kern River	9 20 '09	6	801,000.00
Piedmont	500,000	389,000	1.00	10	Kern River	5 9 '10	1	26,877.30
Pinal	200,000	150,000	1.00	*	Santa Maria	9 30 '10	10	976,843.50
Premier	1,000,000	1,000,000	1.00	160	Coalinga	7 20 '10	1	40,000.00
Producers	500,000	80,000	5.00	600	Midway	9 22 '10	50	120,000.00
Radium	250,000	250,000	1.00	*	Santa Maria	.....	....	.....
Record	200,000	100,000	2.00	40	Coalinga	9 15 '10	7½	100,000.00
Republic	600,000	500,000	1.00	[illegible]	Coalinga	.....	....	.....
Rice Ranch	300,000	300,000	1.00	40	Santa Maria	6 10 '10	1	108,000.00
Rico	100,000	100,000	1.00	60	Midway	.....	....	.....
Royalty	20,000	20,000	1.00	20	McKittrick	9 20 '10	33⅓	29,400.00
S. F. & McKittrick	500,000	50,000	10.00	151	McKittrick	9 1 '10	30	445,000.00
Sauer Dough	100,000	199,500	0.50	270	Coalinga and McKittrick	9 21 '10	3	553,213.50
Section 7	400,000	400,000	1.00	65	Coalinga	.....	....	.....
Section 25	40,000	40,000	1.00	290	Midway	8 26 '10	25	60,000.00
Sesnon	100,000	100,000	1.00	35	Kern River	9 6 '10	7	146,000.00
Shawmut	500,000	500,000	1.00	*	Coalinga	.....	....	.....
Silver Tip	75,000	75,000	1.00	[illegible]	Coalinga	2 25 '10	10	30,000.00
Sovereign	500,000	500,000	1.00	20	Kern River	9 1 '10	1	100,000.00
S. W. & B	400,000	377,000	1.00	40	Coalinga	9 10 '09	1	41,470.00
State	100,000	100,000	1.00	20	McKittrick	.....	....	.....
Sterling	250,000	250,000	1.00	160	McKittrick and Kern	3 15 '10	12½	778,250.00
Sunset Monarch	500,000	497,241	1.00	*	Sunset and Midway	.....	....	.....
Superior	500,000	500,000	1.00	40	Sunset	7 26 '10	1	62,500.00
Thirty-Three	500,000	100,000	5.00	160	Kern River	8 6 '10	4.00	1,090,000.00
Traders	1,500,000	15,000	100.00	410	Kern, Coalinga and Midway	5 15 '10	1.00	209,146.50
Turner	500,000	500,000	1.00	320	Coalinga	.....	....	.....
United	.....	80,751	....	*	Controls Union	9 20 '10	50	2,421,212.93
Union	50,000,000	249,626	100.00	*	All Fields of State	9 20 '10	50	7,117,133.15
Wabash	500,000	300,000	1.00	80	Coalinga	7 19 '10	20	189,000.00
West Coast (com.)	2,500,000	10,408	100.00	*	Los Angeles	.....	....	.....
West Coast (pfd.)	2,500,000	10,408	100.00	*	Los Angeles	9 1 '10	2.00	124,896.00
West Shore	100,000	100,000	1.00	80	Kern River	12 21 '08	[illegible]	235,000.00
Wolverine	100,000	100,000	1.00	60	Kern River	.....	....	.....
W. K. Oil	500,000	500,000	1.00	320	Coalinga	.....	....	.....
Western Union	1,000,000	10,000	100.00	10,000	Santa Maria	4 15 '07	2.00	484,951.00
Hanford	.....	1,000,000	....	....	.....	1 30 '06	22	80,000.00
Kern Oil	.....	.....	.....	.....	.....	11 19 '09	24½	42,000.00
Pittsburg	.....	.....	.....	.....	.....	11 11 '07	43½	124,800.00
Reed Crude	.....	.....	.....	.....	.....	5 31 '10	....	1,167,500.00

Total dividends for September 1910, $669,010.35; total to date, $35,385,514.84. *Information unobtainable.

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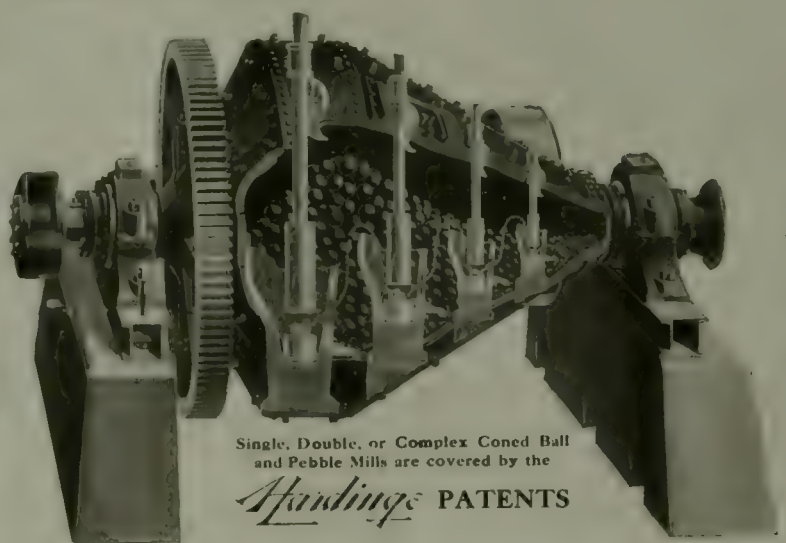

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EDITORIAL

THE flotation processes, which had their birth in Australia, and have thus far found their principal application there, are undergoing a strenuous investigation in the courts with a view to determining the respective rights of the various inventors.

A recent annual government report of Victoria, Australia, on the mining industry makes the interesting statement that the fatal accidents in metal mines was low, being 0.80 per 1000, and that none were killed in the coal mines during the year.

THE Aleutian islands are again the scene of volcanic activity, vessels from that extreme westerly possession of the United States bringing information to that effect. It is not uncommon for good-sized islands to disappear within a few hours from the Aleutian chain, nor for new ones to make their appearance.

FOURTEEN feet of ore assaying ten ounces gold per ton is a promising prospect, particularly when taken at a depth of 80 feet from the surface. This is what is claimed for the Bullfinch mine at Southern Cross in Western Australia. That region has already produced some astonishing mines, and the Bullfinch may belong to this class.

A BONUS of $10,000 gold is paid annually to its white employees by the Oriental Consolidated Mining Company, operating in Korea. This has been done for the five years past on each Christmas Day. It is a splendid recognition of the faithful services of the engineering staff and assistants, which other successful companies whose profits are wholly due to their men might follow to advantage.

ELSEWHERE herein will be found a somewhat novel theory of the distribution of ore shoots in veins, which will doubtless be read with interest by mining men and geologists. Whether the theories there expressed are correct or not, there are many places which seem to bear out the ideas. We hope those who may have given this matter any attention will contribute to the general knowledge on the subject, for it is only by collating the results of the observation and the opinions of the many that we can arrive at the truth.

AN interesting phase of industrial activity in Massachusetts is the attempt of certain corporate interests to have the Gas and Electric Light Commission grant to electric power companies the Right of Eminent Domain, in that State, claiming that such

procedure would greatly cheapen the cost of installation of power transmission lines. Nothing has as yet been heard of any similar movement on the part of large power distributing companies in the West, but if the entering wedge is successfully introduced in Massachusetts a precedent will have been established which would have important influence in forwarding a similar attempt here. There are two sides to the question, of course, but it is difficult to see in what way electric-power distributing companies, which are entirely private enterprises, are entitled to the privileges which the Right of Eminent Domain would give them. Under strict supervision abuses of the privilege might be avoided, but the much desired strict supervision is often a most difficult thing to secure.

NOTABLE progress has been made during recent months in tunneling on the Los Angeles aqueduct, according to the annual report of the engineers to July 1, 1910, recently issued. During May the Elizabeth tunnel was driven from the north portal 567 feet under direction of John Gray, and in April the heading from the south portal was advanced 604 feet under W. C. Aston. The latter run is claimed to be a new American record for tunneling. The difference between the accomplished results in these two instances practically represents the difference in working conditions and in the material passed through. The south portal drains by gravity, the water in the north end being pumped out to the tunnel entrance. The north end also required considerable timber support, with close lagging, whereas very little timbering was necessary in the south end, permitting more rapid progress. Another item of interest, and one seldom observed under similar conditions elsewhere, is that as these headings have advanced the cost per foot has decreased, instead of increasing, as would be the natural supposition. Up to the date of the report, 10,810 feet had been driven from the south portal and 10,705 feet from the north portal, leaving 5345 feet to be completed. Of this, about 3000 feet must have since been completed, if the miners have been able to keep up the rate of driving. The work being accomplished in the Elizabeth tunnel of the Los Angeles aqueduct, and that in the Laramie-Poudre tunnel, Colorado, is setting a rapid pace for those engaged in driving tunnels in any other region, which will be hard to excell.

A Great Mine

Among the famous ore deposits of the world is the Broken Hill, in the Barrier range, New South Wales. The most important property on this huge deposit of lead-zinc-silver mineral is the Broken Hill Proprietary. The company was organized early in 1885, and has since paid 153 dividends aggregating $42,447,000. In addition to these direct dividends derived from profits of ore production, stockholders in this fortunate organization have received $13,641,000 more from leases and interests in neighboring properties, share sales, and from other sources, making a total of profits amounting to over $56,000,000. The mining methods in vogue at Broken Hill were introduced by American mining engineers, or are the result of evolution of earlier American methods. Among the pioneers were W. H. Patton, of Comstock fame, and F. F. Thomas, formerly of the United Verde, of Arizona, and later of the Kennedy gold mines, California. These men introduced a number of American practices, new to Australia, and made it possible to work the great deposits in a safe and economical manner. The present manager of Broken Hill Proprietary is D. G. Delprat, formerly manager of large mines in Spain, where he introduced novel methods of stoping large orebodies without the use of timber. Mr. Delprat is a progressive miner, and believes in encouraging his men, not only to work but to think. In line with the latter idea he has posted about the works a card which asks employees to make any suggestion which in their opinion will facilitate work and reduce expense. Such communications, addressed to the manager, are deposited in a locked box, provided for the purpose. It is needless to add that suggestions coming through this channel from employees receive consideration, and the man submitting valuable ideas is not forgotten by the management.

The Factor For Safety

Many mining engineers, and more particularly the younger members of the profession, appear to consider it necessary, after having made a careful mine examination, to discount the results of their work in making up their reports. This 'factor for safety' ranges all the way from 10 to 30 per cent, or more, depending upon the degree of confidence—or the lack of it—that the engineer has in his own ability to arrive at correct conclusions. He obtains his information by the most painstaking methods, or he should do so, and his work, if properly done, ought to give accurate results. He has had caution, accuracy, and thoroughness drilled into him for years, and he undertakes his professional work with these precepts constantly in mind. Yet, after having accomplished the task of a mine examination in a manner to satisfy his most exacting ideas of what is proper in his conduct of this line of investigation, he discounts his report, that he may be 'on the safe side.' This is a proceeding which he has not been taught and which is not found in the curriculum of any college or mining school.

The entry of this 'factor for safety' in the mining report is not only an injustice to the intelligence, integrity, and care of the engineer, but is even a more serious injustice to his employer, whatever may be the relation of the latter to the property—whether he be the owner, a prospective buyer, or merely acting as an agent for either side. If the mine is sufficiently developed to make the collection of accurate data possible, this information forms the basis for a reliable report, and there should be no factors for safety introduced by the engineer making the report, except as to such portions of the mine as were either inaccessible or undeveloped. In describing such portions of the property a statement to the effect that an examination was impossible, owing to—giving the reason—should be made, and this should suffice.

The Deadly Strap-Iron

A fatal accident occurred on October 12 at the South Eureka mine at Sutter Creek, California, whereby two men lost their lives. Five men were being hoisted, three of whom were down in the skip, two riding on the draw bar. It was the latter who were killed, their companions beneath them being unharmed. This accident was almost identical with one that occurred last spring at the Central Eureka mine, which joins the South Eureka. In that instance two men lost their lives in exactly the same manner and from the same cause. The projecting end of a length of strap-iron track, which, becoming loosened, turned upward, and it is believed was caught by the lip of the skip, and wrenched from the timber, to which it had been spiked. The loose strap of iron swept the two men from the draw bar before they could secure a more firm hold, and they fell from a point near the 700-foot level to the bottom of the shaft, a distance of more than 2000 feet. As the shaft is sunk at an angle approximately 60 degrees, there was no possibility of their escape from death.

The main shaft of the South Eureka mine is but one of a large number on the Mother Lode of California which is sunk for the greater part of the way in a fissure or in 'swelling ground.' The rocks in and near the fissure swell upon exposure and cause the timbers of the shaft sets to move, rendering the use of heavy T rail extremely dangerous, as a movement of the timber sets is likely to result in causing the end of a rail to project above the end of that adjoining, and a rapidly moving skip is very likely to be derailed upon passing such obstruction. Strap-iron, being of lighter weight and of different cross section, bends more readily and has therefore been generally adopted for use in shafts of this type. While less dangerous than T rails the strap-iron tracks have already cost the lives of many men. The reason is to be found in the fact that the shaft timbers are permitted to shift for many a day, menacing the lives of the men constantly, until finally it becomes suicidal to permit them to longer remain without repairs. Moreover, the straps—originally three inches wide and three-quarters of an inch thick—are worn down by the passage of thousands of skip loads of rock, timbers, men, and supplies; the spike holes become worn by the vibration of frequently passing wheels, and corroded by rust. The spikes themselves are reduced in size from the same cause, until, finally, the end of the strap escapes from its fastening, slipping over the end of the spike, and then death lies in wait for the first unfortunate who may pass. This is no doubt exactly what happened at both the Central and the South Eureka mines. This element of grave and constant danger has long since been recognized, but the men become so accustomed to it they no longer fear, until a fatality occurs which results in repairs and rigid shaft inspection—for a time, until their temporary timidity disappears, when things drop back into the same old groove. It is to render such shocking accidents as these less numerous, and to prevent them if possible, that the Bureau of Mines was created, and we believe that its labors will result in a noticeably material decrease in the number of mine accidents and the percentage of fatalities.

Stamp-Duty on the Rand

For years past the stamp-mills of the Rand have led the world in output per stamp. Originally crushing from five to six tons per stamp each twenty-four hours, coarser screens and heavier stamps were introduced to increase the stamp-duty until it reached nine or more tons per stamp daily. Recently, at the East Rand Proprietary, experiments have been made of a radical nature, which may greatly change metallurgical methods, by vastly increasing the tonnage crushed per stamp. These experiments have been carried on at the Cason and Angelo mills, and it is stated present indications are that the stamp-duty will be increased to twenty-five tons daily per stamp. The number of tube-mills is to be increased to one for each ten stamps. These mills have 220 stamps each, and will therefore require, when fully equipped, forty-four tube-mills. It is contended that by this method of operating—crushing with stamps through three-eighths inch mesh, and sending this product to tube-mills, at the rate of twenty-five tons daily per stamp—the expense of power will be reduced fully fifty per cent. At this rate each of these mills will have a crushing capacity of 165,000 tons monthly, or a total for both of 330,000 tons per month. This, however, is considered as beyond the present capacity of the mines, which, by the way, comprise a very large area, but it is proposed to install a sufficient number of tube-mills to bring the output up to 200,000 tons monthly, which would be equivalent to over 6600 tons every twenty-four hours, and would be the largest tonnage output of any gold mine in the world, exceeding the tremendous output of the Homestake of South Dakota by 2600 tons daily.

An interesting problem is presented in contemplation of the ambitious plans of this Transvaal mine management, and that is the ability of the mines to supply this large tonnage continuously for a considerable period. At the beginning of 1910 the East Rand Proprietary Company owned 4312 claims, and early in the year opened negotiations with the Transvaal Government for the right to mine under 169 additional claims, consisting of township, water-right, and other lands. At the beginning of the year ore reserves were estimated at over 11,000,000 tons, having an average value of $5.75 per ton. The width of reef is variable, but as nearly as can be determined from consulting the latest authority on mining in the Transvaal, *Mines of Africa*, the width is from 24.4 inches to 29.2 inches, on which the total development exceeds 84 miles. To December 31, 1909, the total tonnage extracted had exceeded 7,928,000 tons. In any event, notwithstanding the great claim area, extensive development and vast ore reserves available, the constant production of 6600 tons of ore daily, as contemplated, is a proposition which will require all the skill, energy, and good fortune which may fall to their lot, but the Rand is a country of large possibilities.

Hints to Ore Shippers

By S. E. Bretherton

*Until within the last few years I was connected with custom lead and copper smelters—altogether for more than 25 years, acting as general superintendent and metallurgist, much of the time in charge of mining properties, shipping to the same or other smelters, which gave me an opportunity to view the situation from both sides. Mistakes would occur for or against either side, but these mistakes were mostly clerical; in fact, I don't remember of any firm with which I have been associated, attempting to cause improper returns to be made. No doubt in past years there has been crooked work at some smelters and custom sampling works, but this was an exception to the rule. The custom smelters do not have to resort to improper methods if they know their business. It is to be expected that they take the benefit of a doubt in their own favor, the same as in any line of business, and with this the miner does not find fault, if it be not carried to excess. It is sometimes difficult to get those who are making their first shipments to understand the reasons for penalizing the different so-called refractory elements in the ore; such penalties being added to the regular charge for treatment. Part of the smelting business is knowing how to get the proper ores so that the metallurgist can make suitable mixtures and thus reduce the amount of flux to be purchased. Every pound of barren flux which has to be smelted, of course, displaces that much ore on which the smelting company would otherwise be able to charge for treatment. Smelter rates are published frequently in the technical journals. Some of the profits are made by mixing the excess zinc, barium, silica, or alumina of one shipper's ore with the clean ore sent in by some other shippers.

Taking moisture samples, although apparently simple, is really one of the most difficult matters. To ship and crush a lot of ore before taking the moisture sample would result in allowing moisture to escape before the sample was taken. To weigh a lot of lumps in the moisture sample would be wrong, as the moisture they contain would not be dried out at the temperature of the water-bath which is used for drying the moisture samples, so for convenience and safety the boy taking moisture samples usually selects more than the average of the fine, taking about 50 oz. from the freshly exposed parts of the ore pile as soon as possible after the lot has been weighed. The sample is immediately weighed, and dried for 24 hours, the loss in weight being considered as moisture. To satisfy the mine representative, on several occasions this method was checked by drying several entire wagon loads for a week on steel plates over the roasters with slightly higher results than the daily averages. Several times when purchasing copper ore from men experienced in other lines of business, it took some time to explain that after deducting the weight of the moisture from the ore before settling (the ore represented by the weight paid for should be as dry as the sample pulp on which the value is determined), that 1.3% copper had to be deducted from the wet copper assay, as reported on the assay certificate; and that 1.3% was deducted from the copper assay when we sold our matte to the refinery. Occasionally the coarse ore contains the most moisture, as when it is of a porous or spongy nature, and especially when it contains manganese.

The question of accuracy in taking the regular sample to determine the amount to be paid is important. Some prefer hand-sampling, while others prefer automatic sampling. When the ore is sampled by hand, that is, by taking out a certain percentage for samples as the workmen remove the ore after it is crushed to a suitable size—not too small for smelting, the men are supposed to throw out ore of an average. Often they are careless and they require constant watching. This method of sampling is expensive. I like to have the mine representative on hand, for if he will constantly watch the lot being sampled it is a protection to the buyer as well as the seller. On the other hand, most automatic samplers are only suited for sampling accurately such material as concentrate, or ore, after it is crushed finer than is necessary or suitable for smelting in blast-furnaces, as explained in my article on automatic samplers in the *Mining and Scientific Press* of November 28, 1903.

With all the chances there are for making mistakes in determining the value of ore, it is remarkable how accurately its value is determined and how closely different sampling works that follow correct principles will check each other. I have shipped rich ore, concentrate, and copper matte, sometimes containing 30 oz. of gold per ton, to the smelters at Pueblo, San Francisco, New York, and Salt Lake, always sampling and assaying before shipping, and it was seldom that we had to ask for a re-sample. Often we would call for a re-assay, as some of our contracts would not permit a settlement unless the assayers agreed within $1.25 per ton in the combined averaged differences of the metal value. When preparing the sample pulp for assay from ore containing metallic gold and silver, the shipper often thinks he is defrauded out of metallics caught on the screen, when quite as likely, he is not, for it is surprising how the metallics will grind up and work through the sieve with the pulp; but where there is any doubt, all particles remaining on the screen should have lead added, be cupeled, and the results, if any, added to the assay in proper proportion. All this has some bearing on smelter rates, as it is generally thought by the public that part of the smelter profits are derived from such sources, which is quite true, but not to the extent commonly supposed.

The question of 'salting' has also to be considered, the risk being nearly all against the ore purchaser and in favor of the ore seller. It would not be a difficult task for the shipper, or his representative, if he is given a chance, to drop, say 1% of gold or silver into the few ounces of the sample pulp near the end of its preparation (1% equals a fraction over 291 oz. per ton, so that 0.1% would equal 29.16 oz.,

*Presented to the American Mining Congress at Los Angeles.

equal to some $0.83 per ton. If gold were added it would be impossible to decrease the value in the same way by adding anything. There is another danger of salting especially where automatic samplers of the ordinary type are used by small tech lots of ore sacked separately from large lots. Large portions and perhaps all of a small rich lot of ore is crushed and ground fine and treated all the way through as a sample. The cyanides, telluredes chlorides, etc., of gold and silver will gather in the crevices by being ground in and sticking to the machinery and go with the tonnage to be saved by cleaning before the same machinery is used to finish a sample representing one twentieth of a lot of several hundred tons and of perhaps one twentieth the value per ton. A salting of only 50c. per ton of the large lot sample would mean a heavy loss. This is one of the objections to handling small lots; another is that the labor and expense of sampling and assaying a small lot of ore is nearly as great as though the sample represented several hundred tons. Experience teaches that the loss in gold is much greater when smelting rich gold ore than when smelting ore containing little gold. In fact, there is often more gold recovered when smelting ore containing low gold value than is accounted for by the assays. In the usual schedule of smelter rates a lower price per ounce is offered for gold in low-grade ore than in that which is high grade. The only reason I can give for this is that there is less gold on which to make a profit. The Western smelters do not get all this profit. They usually pay from $18 to $20 per ounce for gold and sell it for $19 to $20 per ounce when marketing copper matte, but get more for both gold and silver when marketing it in lead bullion. There are good reasons for this: the loss in gold being so much greater when refining copper matte than when refining bullion, the refiners have to buy accordingly.

The metallurgical loss on silver is much greater than on gold. Lead custom smelters, with good practice, make considerable on the gold and silver, but the custom copper smelter, bidding for silver ore in competition with the lead smelter, suffers a loss. It is the custom to pay for 95% of the silver content at the New York quotation, re-sell the same silver in copper matte, less 5%, which leaves the metallurgical loss anywhere from 2 to 5%, an actual loss against the treatment charged. With copper there is a gain in a metallurgical way with a custom smelter, as the practice is to deduct 1.3% from the wet assay, the actual copper content. Suppose the ore purchased contained 2.6% copper, the smelter would deduct the 1.3%, equal to 50% in this case, whereas, the actual loss should not be greater than 5 or 6% of the real content of the ore. On lead, like silver, the metallurgical loss is much greater than with either copper or gold, which accounts for the smelting company not paying for more than 90% of the lead by dry assay (the dry assay for lead being made either by the regular fire assay, or 2% is deducted from the wet assay). For convenience, where the ore is not too refractory, lead assays are made by the fire method.

After considering the losses and gains on the metals to be marketed such as gold, silver, copper and lead, which have some bearing on smelter rates, take into account the elements which enter into the cost of smelting such as manganese iron, lime and magnesia on the credit side, and zinc, sulphur, silica, alumina, barium and arsenic on the debit side. At some of the copper smelters in Shasta county, California, silica is placed on the credit side, due to the fact that the copper ore in that vicinity contains little silica and a large excess of iron, so that the smelting companies have to make rates to suit local conditions. The shipper, when sending in a lot of siliceous ore, at, say $5 treatment per ton, neutral basis rate, is disappointed, if he is not experienced, when it comes to final settlement, for if the ore contains, say, 75% silica, 13 alumina and 2 iron, the alumina should be added with the silica, making 88% insoluble. The metallurgist may later call for a fused silica for his guide in figuring ore mixtures, for the 'insoluble' deducted by the smelters as 'silica' may contain alumina and barium sulphate, the latter more objectionable than the silica itself, which he has to figure in his calculation on a different basis. Crediting 2% iron leaves 86% silica to be penalized, at 10c. per unit, this amounts to $8.60 per ton to be added to the treatment of $5 per ton, a total of $13.60 per ton for treatment. Such penalty creates a hardship on the shipper of silicious ore, yet, on the other hand, if the same man sends in a lot of ore containing 10% silica and 60% iron, the excess iron over silica is 50%, which at 10c. per unit amounts to $5, which credit deducted from his nominal rate of $5 leaves no smelting charge. This is a high premium for the iron; but suppose the metallurgist has to purchase barren iron ore for flux, containing 64% iron and 4% silica. In practice, it requires approximately 2% of iron, or its equivalent, to 1% silica, the actual excess of iron would be only 56%, equal to 28% silica, in regular lead smelting practice. The smelter gets $2.80 from the 28% of silica penalty, whereas 64% iron usually costs double that amount. This helps to explain why there have been so many smelting company failures. The copper metallurgist has the advantage in being able to make a more silicious slag, 1% iron being equal approximately to 1% silica, but if it is a small plant and the matte is shipped, instead of being converted locally to metallic copper, this advantage is mostly lost by the iron being shipped in the matte. It is difficult, in fact almost impossible, to explain all of these 'give-and-take' points to the shipper.

Now as to the penalties on sulphur or zinc. Barium is weighed with the silica usually as insoluble. Too much zinc causes trouble in three ways: first, by volatilization, carrying off silver; second, by helping to form incrustations on the walls of the furnace; and last, but not least of the troubles, making a viscous slag. By mixing the ore containing too much zinc with enough clean ore this trouble is avoided; but why should the shipper of ore containing excess of zinc, get the benefit of this mixing any more than the shipper of silicious ore should get the benefit of ore containing excess iron shipped by some one else, or the benefit of the mixtures made at the smelters by

the experienced metallurgist, where the company must hold large stocks of ore, tying up much capital on which interest has to be paid, until such time as ore to make suitable mixtures can be secured?

Even in a mining district like Leadville it was necessary to carry a large ore supply, the average character of the ore, sometimes changing in a few months from an excess of silica to an excess of iron. Then silicious ore was shipped in from the southern end of the State. For years it was a case of 'dog eat dog' with the smelters, each one daily hoping the other would close down and quit the business first. The close competition among the Colorado furnaces for ore was a great benefit to the miner, but a serious matter to smelters. This unhealthy state of affairs could not last and the fight meant the survival of the strongest until there was left in Leadville only two lead smelters running in the fall of 1893, from the thirteen in and around Leadville in 1879. It was a wise move on the part of the conflicting smelting interests in the West when they agreed to combine into practically one company. It not only did away with competition—it did away with the greater part of the fixed expenses, such as numerous superintendents, metallurgists, ore buyers, engineers, etc., and reduced the management to a few of those who had the most ability combined with personal influence. The smelting combination thus formed enabled them to increase the smelting charges to the shipper, but not as much as one would expect, nor was it necessary. The advantages gained by having only to operate a few plants to treat the same amount of ore, the exchange of ore between the different plants to get suitable smelting mixtures, improving and operating only those plants which could treat the ore to the best advantage, are so great that the smelting combine can give the miners lower rates than were possible with too many independent smelters and still make good interest on the value of all the plants (both idle and operating), that went into the combine.

I do not wish any one to infer that I am defending any 'smelter trust.' On the contrary, it fell to my lot to be next to the head, and part of the time at the head, of smelting companies that had to compete with the organizers of the so-called 'smelter trust,' and the trust itself for years. Reasonable competition is necessary in all classes of business. There is still a limited field for smaller smelting enterprises where they are protected by long railroad hauls, or by distance from the railroad, especially if they adopt high concentration and ship out rich products.

There is one phase of the business the public does not appreciate to its full extent. That is the change in the value of metals. One would naturally suppose that if the prices go down and then up again, the averages would protect the purchaser, but such is not the case. High prices mean a greater number of mines producing and much larger ore stocks being carried on which to lose, than is carried in stock with low prices and small production. I remember at the American Smelting Works, at Leadville, in 1893, there was about the largest stock of ore on hand ever carried when silver took its remarkable drop in price, the price of lead also dropped in sympathy. Those who are in the custom copper smelting business had a similar experience in 1907. If the smelters and refiners could be assured of a stable price for metals, even if that price were low, they could afford to make the treatment charges lower. Under ordinary conditions there is a profit made on all the metals treated in addition to the regular reductions for treatment. There is also a profit on the penalties charged for sulphur and arsenic, not so much in lead smelting as in copper smelting; in fact, in some cases, one of the most serious troubles is lack of sulphur to save fuel and to form matte in the copper-matting furnace. There is no advantage in having arsenic in the ore under any circumstances, but with copper smelting the penalty is usually too high. Several years ago a friend of mine wrote me that the smelters were deducting about $6 per ton from the assay value of his ore for arsenic penalty and adding that much to the regular treatment of his copper ore. I explained to him by letter why they should not make such a charge. Afterward he wrote me that my letter enabled him to have the penalty on arsenic removed. Often the ore shippers themselves are to blame; they may not know all the points in connection with making a contract for ore settlements; they are expecting to be cheated and perhaps demand a higher price for some metal their ore contains than they are entitled to. If the shrewd ore purchaser allows it, he catches the seller on something else. What the mining and smelting industry needs is more uniform prices for the metals. This can only be obtained by the Government taking the matter in hand and publishing monthly a statement of total stocks on hand held by every one. This would prevent the large producers either under or over-estimating their stocks to disturb the market in order to create unnatural prices for their own benefit. The question of smelter rates must be settled between the seller and buyer.

The adjustment of penalties charged by the different smelters, and prices paid for the metals should also be left for the present to be settled between the miners or their representatives and the smelters themselves. Each locality is different and requires different rates. No doubt it would be to the advantage of the miners of each district to combine and employ a competent person to make contracts and settlements for them. A saving of only $1 per ton would be worth considering. The smelting companies would rather deal with a few who understand their business than a greater number who do not.

General Manager Scott of the Siamese Tin Syndicate, Ltd., in his report for the year 1909 of investigations made by him makes the statement that one prospect has been examined that looks promising, covering about 280 acres of ground with a depth of 34 ft. and averaging approximately 19c. gold per cubic yard, and expects a report favorably on an additional 350 acres upon which boring is now in progress. He believes the company may rely on at least £600,000 worth of tin that may be worked at a profit. There are other prospects, but only one or two have been worked at a profit.

Gold Mining in Randsburg Quadrangle, California II

By Frank L. Hess

(Continued from Page 538)

Orebodies—The gold deposits in the Yellow Aster mine are typical of those found in many other mines of the vicinity. There are three types: 1. Deposits along faults in crushed schist and granite. 2. Stockworks in granite. 3. Fissure veins with more or less quartz. In only two or three other mines of the area is there more than one type of gold deposit and no other has all three types. The three types, though distinct for the most part, in places grade into each other. Very little visible gold is found in the mine and that little is mostly in small particles. There is a remarkable lack of other metallic minerals. A little pyrite and arsenopyrite, iron oxide derived from them, and some scheelite are the only ones certainly identified, though it is reported that some pannings show a heavy mineral of a light-yellow color which may be wulfenite.

Fault Lodes.—The faults were probably caused by the stresses accompanying the intrusion of the granite. They are probably nearly all normal or gravity faults, but the amount of movement is not known in any ore-bearing lode. The movement has been, in each fault, in different directions at different periods, and these directions vary from vertical to horizontal. On the Rand level the main fault is followed by the Jupiter drift, running N. 80° W., with many minor curves and variations in its course. The gulch cuts through the fault at the Rand level, where the fault turns and runs about S. 70° E. The dip is from 27° to 44° to the north and east, but it is less toward the bottom of the workings, 300 ft. below the Rand level. The dip is wavy, as is the strike of the fault.

The fault is slickensided in many places, and accompanied by crushed material from 2 to 80 ft. thick. The greatest thickness is in the 100-ft. level. The rock is not all crushed fine, but the fault branches with finely crushed material along each part, and the rock between the lesser faults is badly broken. The fault cuts both schist and granite. In both rocks the comminuted material along the fault is so fine and decomposed that in many places it is almost impossible to tell whether the material is schist or granite. As would be expected there is great shattering of the rocks and many minor faults with much slickensiding. A great deal of work has been done along the fault. Various levels and stopes follow it to the top of the mountain, and below the Rand level four levels were worked. The amount of ore extracted decreased as the depth increased, and little was done on the fourth level. Below the third level the quantity of crushed material along the fault decreases considerably, iron and arsenical pyrites appear, and gold decreases.

Below the Rand level large chambers were taken out in granite lying in the fault zone. One square-set stope on the first (100-ft.) level was over 100 ft. long, 50 ft. wide, and probably 40 ft. high. The gold in this stope is said to have been coarse, in places reaching the size of wheat grains. The ore is thought to have averaged $10 per ton. Above the stope a sill of granite has been forced between the folia of the schist, which here has a dip of 30° N.E., and part of the sill has been taken out for ore. Where the granite is ore bearing it is soft, the biotite is bleached, and the feldspars sericitized. Masess of granite have been mined in the second and third levels, which are probably part of the same body that was mined in the first level. The workings on the fourth level were filled with débris and could not be entered, but a small square-set stope is reported to have been taken out of granite. Near the top, on the northwest side of the hill, several other faults, approximately parallel in strike to the northwest limb of the Jupiter fault but with different dips, have been followed by the workings. Two other fault zones have also been worked on the southeast side. One, which is called the K. P. fault, from the

Yellow Aster Mine and Mills, Randsburg, California.

*Abstract from Bull. 430-A, U. S. Geol. Surv., 1909.

name of a stope along it, is about 300 ft. southwest from the Jupiter fault. It strikes northwest and dips at various angles. Near its junction on the northwest with a large shattered granite mass the dip is 30° N. E. Toward the southeast the dip steepens nearly to 60°. Some ore has been taken out along its course, but it has not been a large producer. About 75 ft. farther southwest is another fault called the Oriental. In strike it is nearly parallel to the Jupiter fault south of the gulch, and the dip is in the same direction. It has been followed for over 1000 ft., and at the southern end it is very irregular in direction, is split up, and shows signs of either changing its direction or dissipating into a number of small faults. A stull-stope 5 to 18 ft. high, reaching nearly to the surface, has been taken out along it.

Stockworks in Granite.—The second type of ore deposit in the Yellow Aster mine is made up of large bodies of granite, which are shattered and impregnated with gold along narrow cracks forming complicated reticulations or stockworks. The biotite of the granite has been bleached and the feldspar decayed. Gold is not found in paying quantity where the granite is not largely decomposed, but on the other hand there is no assurance of gold where the granite is decayed. In the lower levels, where oxidation is not so far advanced, there is considerable arsenopyrite in the rock. On the Rand level two large square-set stopes, the 'East sets' and the 'West sets,' have been taken out from stockworks. They lie about 500 ft. southwest (into the hill) from the point where the Jupiter fault crosses the gulch and almost form a chord to the crescentic fault. The East sets have a length of 265 ft. and a maximum width of 95 ft. and 50 or 60 ft. high. They have a strike between N. 75° W. and N. 80° W. The sets have largely been filled with waste, so that the upper sets are not accessible, and the mine maps show no cross sections. The West sets are 340 ft. long, have a maximum width of 50 ft., and reach upward to the bottom of the glory hole, 115 ft., and strike nearly northwest. The two stopes are in the same mass of granite, 150 ft. of which lies between them. It is said to be a low-grade ore. Below the Rand level large square-set stopes which extend to the first level have been taken out in the granite mass.

Strong faults with a stiff clay gouge bound the northeast side of the granite in the West sets and dip 45 to 50° N.E. In places the gouge is damp, possibly from leakage of water in the open-cut above. The Nero stope, which extends from the Rand level to the first level, follows the fault. It is not known what the value of the ore taken from the stopes in the granite has been, but it is believed to have been from $4 to $5 per ton in the East and West sets and probably about the same in the other stopes. There have been places where the value was considerably greater, but the figures given are probably near the average.

Fissure Veins.—Lying within the curve of the crescent-shaped Jupiter vein, between it and the granite, are two nearly vertical veins known as the Jake Price and the Rand Vertical veins, striking about northwest. On the 100-ft. level they are 65 to 110 ft. apart, the Jake Price being the nearer to the Jupiter fault. On the Rand level there is little to be seen of the Jake Price vein. Above the first level the two veins lean toward each other so that they are only a few feet apart at the Rand level. The Rand Vertical vein runs above the Rand level and joins with the Jupiter fault. At the junction and above it some rich ore has been taken out. The veins have been stoped continuously from a point below the 200-ft. level to the Rand level, and the Rand Vertical for perhaps 50 ft. above to the Jupiter fault. Both of the veins are in narrow shear zones that lie mostly in granite dikes but also cut the schist. The cracks of the zone are considerably iron-stained, but no other mineralization is visible. There is some

Johannesburg, Kern County, California.

bleaching of biotite through several feet of granite along the vein. Parts of the veins have been rich, yielding ore worth over $100 per ton. The Rand Vertical, below the second level, follows a granite dike and has been followed downward by a shaft for more than 150 ft. In many places the dike is only 3 to 4 ft. thick, and at the depth mentioned it dips into the wall to the north. Several other fissure veins similar to the Rand Vertical and Jake Price are exposed in the glory hole.

Mining.—There are between 12 and 15 miles of drifts, tunnels, and shafts in the Yellow Aster mine, but at present practically all the work is being done in the glory hole, and it is the intention to work the mine hereafter entirely by open-cut. The grade of the ore mined is thus reduced, but it is estimated that it can be kept high enough to yield a profit. A tremendous amount of overburden must be removed and much nearly barren material must be milled, but the cost of mining is low.

Other Mines.—Across the valley, northeast from the Yellow Aster mine, are four mines opened upon a fault that strikes northwest and dips 30 to 75° N.E., with many local variations in dip and strike. A diabase dike, from 15 to 40 ft. wide and a little more than a mile and a half long, runs along the course followed by the fault. In some places it is cut by the fault; in others sills from the main dike run along the fault, and the fault shows that movement has taken place along it since the intrusion. The diabase both cuts and is cut by granite porphyry dikes. It is, therefore, contemporaneous with the porphyritic intrusions and with the faulting, having been later than the first breaking of the fault, but

movement in the fault continued after the intrusion of the diabase. The gold deposits of the mines along this fault belong to the fault lode type. From northwest to southeast mines along the fault are the Little Butte erected with an output of $15,000 and now unworked; the Kenyon, or '400'; the Butte Wedge which in connection with the Kenyon is reported to have produced $600,000 and the Butte reported to have produced $25,000. Still southwest of the Butte are the Philadelphia Wedge, Jenny Lind fraction, Hector and Magpie claims. Some ore is said to have been taken from each of these. There is more quartz in the fault matter in these mines than in the Yellow Aster. The distribution of value is exceedingly erratic and the ore is ordinarily in lenses, which may be either rich or poor, large or small. One lens in the Kenyon was 10 ft. thick and averaged $100 to the ton. It was 40 to 50 ft. long. Other lenses are only a few inches thick and a few feet long. The material on either side, so far as can be told by the eye, may be precisely similar but almost or totally valueless. North of Randsburg on the claim known as the American, the principal workings are on a fault striking N. 20 to 30° W. and dipping 40° E. A claim farther north and others in the vicinity are in comparatively flat ground known as the Pumpkin Patch and are all along similar faults. They have produced a few thousand dollars in gold, but none are now being worked, as the paying ore near the surface was soon taken out. At Johannesburg the Phoenix (formerly the Val Verde) and the Pinmore are working upon fault lodes similar to those of the Butte and Yellow Aster. In the Phoenix both diabase and granite-porphyry dikes have been intruded along the fault. In the Pinmore the faulting is complicated. The mine is partly caved, and there are no maps, so that the system of faulting was not solved. Southeast and south of Randsburg the Rattlesnake, Gold Bug, Baltic, Blackhawk, Gold Coin, California, Nancy Hanks, Big Horse, Josephine T. G., Golden Link, Hard Cash, and some others are situated on similar faults and have produced more or less gold. In the Baltic ores said to carry about $7 per ton were taken out in one stope, which was 24 ft. high and 60 to 70 ft. broad. Scheelite is said to show in most of the pannings from the mine, and a ton was taken out in one place. It is also found in other claims. The lode on the Buckboard claim 2½ miles in a direct line southwest of Randsburg, may be classed with the fault-lode type of deposits, though it shows characteristics of the fissure-vein type. The deposit is along a fault with a dip varying from nearly flat to 35° N. 40° E. The fault is slickened in places. A fine-grained light-colored dike, with no porphyritic crystals, follows the fault so far as exposed on the upper side of the vein matter. The dike, though somewhat broken, is not much crushed. In places it is 4 ft. thick and at other places pinches out. A small, more basic dike shows in a few places. The vein matter is quartz, and apparently replaces the schist crushed by the fault. The quartz is everywhere impure and porous, but in general is comparatively white. At one place about 200 ft. down the incline from the mouth of the shaft the vein is 15 ft. thick. In other places it pinches or degenerates into mere stringers in the schists. There are many small pseudomorphs of hematite after pyrite or arsenopyrite. A thousand tons of ore from the Buckboard was hauled to Johannesburg for milling tests and is reported to have run $6 per ton.

Other Stockworks.—The only gold deposits of the stockwork type in the quadrangle besides those of the Yellow Aster mine are on claims adjoining the Yellow Aster properties on the northwest. So far little or no ore has been taken from them. The granite is said to carry $4 or $5 per ton. To pay, it would have to be worked on a large scale, and as water would have to be obtained—a very expensive undertaking.

Other Deposits of the Fissure Type.—The mines of the quadrangle which work fissure veins are in what is known as the Stringer district, along the southeastern side of the Rand mountains, from 1½ miles south to 4½ miles southwest of Randsburg. They are comparatively small mines, working veins which, though generally narrow, are in places rich. The district receives its name from the narrowness of the veins. The vein upon which the Sunshine and La Crosse mines are situated is the best known. The Sunshine is on the south side of a shallow valley and the La Crosse is a few hundred feet west, on a small hill. The vein strikes N. 80° E. and is said to dip 5 ft. south of the vertical in a depth of 450 ft. The country rock is gray mica-albite schist, which strikes N. 10° E. and dips 70 to 80° E. The vein is in places 8 or 10 in. thick, but is ordinarily less. From 2 to 6 in. is the average thickness. Quartz crystals have grown from the sides and the combs have grown together and interlocked until the vein is nearly solid. In only a few places are there vugs in which the quartz crystals retain their individuality. Gold is visible in the vein in many places. The largest aggregates of gold seen in the quadrangle were taken from the 350-ft. level of the Sunshine mine. Two pieces, thought to weigh about 3 oz. each, were made up of small crystals of gold. The vein is crossed by a number of faults which offset it a short distance and by others which, as far as prospecting at that time showed, cut it off completely at both ends. Other veins of the same type occur in the Stringer district on the Winnie, Napoleon, Santa Ana, Pearl Wedge, Merced, Royal, Corona, Sidney, Yucca Tree, Bully Boy, Golden Link, and other claims that are not worked. The Napoleon is reported to have yielded nearly $1000 per foot from a shaft 100 ft. deep, but this seems to have been its richest part and it was not being worked when visited. The Winnie was the first of the Stringer claims discovered. At one place the quartz was 2 ft. thick and gave $140 per ton on the plates. This was both the thickest and the richest part of the vein. Where worked in November, 1909, the vein was split into four or five branches, from 1½ to 3 in. thick and spread through 3½ to 4 ft. of schist. The ore here yielded about $50 per ton on the plates. The quartz is said to show a small amount of scheelite upon panning. In the Gold Bug claim the scheelite occurs in small lenses in the gold ores—the scheelite itself not carry-

ing gold—and is not so badly crushed as the gold ore. In the Sidney mine scheelite of a bright buff color occurs in veins with gold, but it was seen only where the vein had been more or less disturbed. Gold occurs in the vein close to the scheelite. In the Corona claim, three miles south of Randsburg, on the 50-ft. level, a lens of quartz 5 in. thick contained about an inch of albite feldspar in the middle. A sample taken from this part of the vein was crushed and panned and gave a prospect of gold, equivalent to $25 per ton.

The veins in the Stringer district are all more or less disturbed by faults. On the Bully Boy, two miles south of Randsburg and three-fourths of a mile west of the Sunshine mine, a vein which was rich at and near the top is cut off 75 ft. below the surface and has not been found again. On the Corona, Sunshine Fraction, and Sidney claims the veins are also badly faulted. The Gold Coin and Stanford claims, three-fourths of a mile east of the Sunshine mine and nearly two miles southeast of Randsburg, have a combination of both fissure veins and fault lodes. Along the fault in silicified crushed material there are lenses of rich ore carrying visible gold. Besides the fault lode there are a number of narrow veins, some of which are little wider than a knife blade, but in places they reach a thickness of 8 in. The veins in some parts carry $120 per ton in gold. The richest parts are said to be where there is most iron oxide.

Outside of the Stringer district, veins on the St. Elmo claim 5½ miles southeast of Randsburg, should also be classed as fissure veins. The veins cut granite. The St. Elmo dips 78° N. 60° W., and is 4 to 10 in. thick. It is reported that $45,000 was taken from a small open-cut between 10 and 15 ft. deep. Several shafts were sunk in search of other ore, and some stoping done on the veins, but apparently no large bodies of ore were found, as the mine has not been operated for three years or more. The ore is quartz carrying visible gold and is said to have been rich. Scheelite is said to have been found in pannings of the crushed ore, but none was found in a specimen tested by the writer. The mine is in comparatively level ground and no other paying gold ore has been taken out nearer than the Blackhawk mine, three miles northwest, though there is a narrow, short gold-bearing vein a mile north by west on the Murphy claim. This property is situated in the Atolia scheelite belt, and the vein is practically parallel to the scheelite veins. It strikes east-west and is vertical. A shaft 20 ft. deep has been dug on it, and enough gold was taken out to pay for the labor.

Summary and Theory of Origin of the Gold.—The rocks of the Randsburg quadrangle may be summed up as follows: granites of different textures and compositions, covering about five-tenths of the quadrangle, occur in the south and north; mica-albite and chlorite-albite schists, of unknown age and believed to be of sedimentary origin, with some interbedded quartzite and limestone, occupy over one-tenth of the area and form the Rand mountains; somewhat metamorphosed sediments, probably of Paleozoic age, including many beds of limestone, occupy less than one-tenth of the quadrangle; lavas, probably of Tertiary age, composed of rhyolite, andesites, basalts, and others, occupy more than two-tenths of the area; sand and other unconsolidated fragmental coverings hide somewhat less than one-tenth of the rocks of the quadrangle.

A large crescent-shaped granitic intrusion, four miles long and one-half mile wide, cuts the schists of the Rand mountains on the south side of Randsburg. Near this, and probably connected with it, are many porphyry dikes of widely varying composition.

The rocks are extensively faulted, and the faults near the Rand mountains are believed to have been largely caused by stresses accompanying the intrusion of the granite. Some granite porphyry dikes were intruded along the faults, after the fault-lines were established, as there is much crushed material alongside the dikes. There has been some movement in the fault since the intrusion of the dikes, and they have been more or less shattered by it. In other places the strike of the porphyries is across that of the faults, but nowhere are they known to cross the faults without displacement. Most of the faults and fractures due to the intrusion of the granite strike within the northwest and southeast quadrants. The principal gold deposits lie in the schist area, rather closely connected with the granite. They may be divided into three principal groups: (1) fault lodes, deposits along faults in crushed schist and granite; (2) stockworks in granite; (3) fissure veins, with more or less quartz. All three types occur in the Yellow Aster mine. The mines north and east of Randsburg are of the fault-lode type.

Although stockworks form some of the most important deposits in the Yellow Aster mine, no other mine has produced much ore from them. In the Stringer district, lying south and southwest of Randsburg, the working mines are all upon narrow fissure veins which have a maximum width of 2 ft. and a maximum length of 500 ft. All are badly cut by faults. The ores in the fault-lodes and stockworks are greatly oxidized where productive, and all shafts are comparatively shallow.

In mines there always should be certain rules respecting the use of explosives and the foreman should be charged with the duty of seeing that these are strictly enforced to the letter. The cartridges should always be kept in safe places removed from shocks of all kinds and especially from the detonators; they should not be fitted with the detonators except directly on the spot where they are to be used and only just the number required for immediate use should have the detonator attached, for it is always dangerous to remove the detonator from a cartridge. Where this has to be done, no precaution should be neglected and the cartridges thus removed should be stored in a safe place. If a cartridge with the detonator attached has become frozen the detonator should only be removed after the cartridge has been thawed, and in this last operation altogether special precautions should be taken.

Surface Indications of Ore-Shoots in Depth

By William H. Storms

The following is written in the hope that others who may have observed the phenomena here described and have given the conditions some study, may throw additional light on the subject. I have endeavored to express my ideas as plainly as possible, for it is not always easy to explain clearly to another what may seem a very simple proposition. The theories advanced are not altogether new, and many engineers and geologists doubtless have observed some of the conditions hereinafter referred to. The adoption of arbitrary laws or rules to govern the judgment in the valuation of mines and mineral deposits, particularly those that are undeveloped, is dangerous and is likely to lead one into serious error. Yet, when after years of observation in many regions, widely separated, it is noticed that certain topographical conditions are almost invariably found to accompany the occurrence of rich ore deposits, it seems proper at least to submit these observations to the criticism of others who have had similar or even better opportunities for observing the facts, and in this way, by the collation of the evidence submitted by numerous observers to, perhaps, learn whether or not there are any rules that may be applied to undeveloped mines which would be of value in guiding those in charge of mining operations at new properties.

The observations here set forth are particularly the result of a careful study of conditions on the Mother Lode of California, but I have, with equal care, applied them to mines elsewhere in South Dakota, Colorado, Arizona, Nevada, Mexico, and Central America, where I have had opportunity to personally study conditions, and I must say I have not as yet found the place where the more important 'rules,' if this term may be permitted, will not apply.

My observations, particularly on the Mother Lode of California, for over 100 miles, have led me to the following conclusions as to the superficial or topographical conditions which may be considered indicators of the occurrence of ore-shoots beneath the surface:

1. A smooth hillside, or nearly level, or plane surface, without gulches or gullies, or other depressions crossing the strike of the Lode is essential.

2. Gulches or natural depressions crossing the strike of the Lode, or vein, are the physical expression of disturbance beneath the surface, and it is rarely, if ever, that an ore-shoot will be found to extend from solid unbroken ground beyond such surface evidence of disturbance. It is important to notice the relation of vein outcrop to these gulches, breaks, or depressions, particularly where there is more than one vein. For instance, where the belt is wide, including several veins, the irregularities of the surface on the foot-wall side of the belt will be found to have a direct influence on the veins in the immediate vicinity (on or near the foot-wall), while having no evident effect on a vein on the opposite side of the belt near or at the hanging wall. This rule, of course, applies to the occurrence of depressions on the hanging wall side of the belt, the influence of which is not noticeable on the foot wall side. However, gulches or depressions which in their course extend entirely across the belt will be found to have a direct influence on every vein occurring in the belt in its vicinity. These cross-canyons or gulches, are particularly pronounced in their effect, no ore-shoots passing through them without much disturbance, and usually a complete discontinuance of pay ore. Occasionally such gulches mark a fault-line, particularly if the gulch has steep sides—broad flat depressions being more likely to mark a flexure in the rocks, and not necessarily an abrupt fracture and displacement. Should the fault or flexure have a dip, one way or another, from the vertical, the ore-shoot may take a similar trend or pitch along the fissure in which it occurs, but eventually the shoot will be found to terminate when the region of disturbance has been reached, whether it be vertically beneath the break, appearing on the surface or in depth at some distance to one side of it.

3. A gouge at the surface is desirable, whether quartz be present or not, as the gouge is indicative of a line of weakness and of movement which has taken place, usually subsequent to the formation of the vein. A vein of payable ore may exist below, however, when there is neither vein nor gouge at the surface, nor any other evidence to indicate such occurrence of ore beneath. The South Spring Hill mine near Amador City, supplies an example of this somewhat unusual condition. There the apex of a vein was discovered at contact of black clay slate and amphibolite schist at a depth of 500 feet, at which level the vein began as a mere wedge of quartz, but which widened rapidly with depth. This shoot produced $1,500,000. The surface topographical conditions were not unfavorable to the occurrence of an orebody, notwithstanding that there was no evidence of one to be seen.

4. The occurrence of gouge at the surface is by no means an indication to be relied upon of the occurrence of a payable ore-shoot below. Experience in a number of places has demonstrated this.

5. Often, and it may be said generally, a seepage of water may be found at some place along the surface outcrop of the fissure containing ore. This, like the gouge, cannot be implicitly relied upon as positive evidence of the occurrence of ore beneath the surface, for water will issue with the same facility from a barren fissure, from cracks, from zones of fracture, and from the contact of a dike with the enclosing rocks or from the dike itself, as from a fissure containing the richest ore. It is well to remember, nevertheless, that every pay-shoot is, or has been, accompanied by water, which came into it from below or from the walls, following the fissure, and in many places confined to the channel by selvages of clay or gouge. If the water rises to the surface, it will seep or flow out at the lowest places along the outcrop, at which points these outlets are recognized as seepages or springs. In many places

the vein-water fails to reach the surface, or perhaps it flows only during the rainy season, and for a short time thereafter. It may be concluded, then, that a spring or seepage of water is the evidence of a vein, a fissure, zone of fracture, crack, or dike, or even a contact of two rocks, beneath the surface, but it cannot be accepted as *prima facie* evidence of a pay-shoot beneath. On the other hand, pay-shoots, or veins containing them, do not always indicate their proximity by the issue of springs of water at the surface, for some very valuable ore-shoots are known not to have been accompanied by such water seepages or springs, at least not within historic period.

6. Where a series of branching or nearly parallel veins occur it is seldom that a pay-shoot will be found immediately back of another on a parallel fissure—they generally occur *en echelon*. While the former principle, as it seems, may usually be depended upon with much assurance, the latter is by no means invariable. In other words, a pay-shoot in one vein is not certain, by any means, to be followed closely by another in a neighboring parallel vein.

7. There is no means of determining, without actual development, at what distance a pay-shoot will be succeeded by another in the same vein, or in an adjacent parallel vein, nor at what depth a pay-shoot will occur.

8. Mineralization along the surface, as indicated by the extensive decomposition of the country rock for a considerable distance on either side of a fissure, is an excellent sign of the existence of strong veins or bodies of ore below. There are exceptions to even this rule, but such mines as those of the Utica group at Angels, the Kennedy, near Jackson, the Keystone, at Amador City, and the Bunker Hill, near the Keystone, are a few of the many excellent examples of extensive mineralization at the surface where valuable mines have been developed. It is important, however, to recognize the fact that the Eureka Consolidated mine, at Sutter Creek, and a few other noted mines, possess this characteristic in surprisingly moderate degree.

9. A quartz outcrop is not essential to the existence of a valuable mine, nor is a quartz cropping a reliable indication of a body of pay-ore. Some of the poorest mines on the Mother Lode of California have huge white outcrops of barren quartz, and some of the best mines on the Lode have little or no outcrops at all.

10. There is no means by which the value of ore beneath the surface, as yet undeveloped, may be even approximately determined, regardless of all signs at the surface, favorable or otherwise. Only actual development can make this condition known.

11. Strike and dip in veins is generally considered as unimportant, but on the Mother Lode, and to a great extent elsewhere, the ore-shoots are larger and often richer where the veins flatten in dip, being narrower and poorer in the steeper portions. To this, like most of the other conditions, there are some exceptions, but the greater number of places conform to the conditions described not only on the Mother Lode, but generally elsewhere.

In a general way the conditions above described are found to apply throughout the length of the Mother Lode, and to many other districts as well. Some of the more noted instances are the Princeton mine in Mariposa county; the Jumper group, at Stent, App group, at Quartz, the Rawhide mine; the Bonanza mine, at Sonora, the Soulsby and the Confidence mines in Tuolumne county; the mines of Carson hill, the Utica group, at Angels, and the Sheep Ranch mine in Calaveras county, the Zeila and the Kennedy-Argonaut group; South Eureka, Central Eureka, Eureka Consolidated, Keystone, Bunker Hill, and Plymouth Consolidated mines in Amador county. All of the mines named are famous and have produced many millions of dollars.

Other noted examples are the Yellow Aster, in Kern county, California; the Homestake group, South Dakota; all the mines of the Comstock Lode, Virginia City, Nevada; and in this connection it may be said that John A. Church and George F. Becker each have called attention to the relation of ore deposits to surface topography of that famous Lode; the Camp Bird, Revenue, Atlas, Tomboy, Smuggler-Union, and Liberty Bell mines in the San Juan region of Colorado; the Independence, Portland, Mary McKinney, El Paso, and a score of other mines in Cripple Creek district, each illustrates the more important principles above described.

These are mostly gold mines, but the rules apply with equal force to mines of silver, copper, and lead, such as the Broken Hill, New South Wales; Mount Morgan, Queensland, Australia; the Bunker Hill & Sullivan, in the Coeur d'Alene, Idaho, Dos Pilares, near Nacozari, Mexico; and to the original mine of the Espirito Santo, near Cana, in the Darien, South America, and also the Rosario in Honduras. These, and many others, answer to practically every requirement of the 'rules,' as expressed in the foregoing.

That the theories will apply with equal force to bedded deposits, such as those of Leadville, I am not sure, though I know that to some extent they are not at variance with conditions in that district, nor with the bedded deposits of the Black Hills of South Dakota.

The most important lesson to be learned, it seems to me, is from the negative side. While it may be impossible to tell how good a mine may prove to be with ideal superficial conditions, it seems a safe proposition to 'steer clear' of mines situated in gulches crossing the strike of the vein, or in a country cut by a succession of short ravines. There are few good mines within the range of my experience, situated in such places as these, though there may be important exceptions, of which I have no knowledge.

This has been written, as I said in the beginning, in the hope of interesting others to the extent of giving to those engaged in the industry the benefit of their observation along these lines.

Phosphor-bronze wire is employed in the manufacture of screens that are to be subjected to contact with acid which corrodes brass and steel wire screens.

A Modification of Pachuca-Tank Practice

By Amos J. Yeats

Having seen various articles in your journal on the subjects of pulp agitation and zinc-dust feed in connection with the cyanidation of silver ores, and believing that there are some interesting developments on these lines, I give you the following data. In this plant the usual custom in grinding is followed, namely, preliminary crushing in rock breaker and stamps (20), then tube-mills, one 4 ft. 6 in. by 16 ft., Allis-Chalmers mill and one 8 ft. Hardinge conical mill. Classification is accomplished with Dorr classifiers and thickeners, followed by pneumatic agitation in Pachuca tanks, 13 by 55 ft., filtering on two Oliver continuous slime filters, 11 ft. 6 in. by 12 ft., and precipitation with zinc dust in Merrill press. The crushing, classification, and settling of the ores here present no unusual features, but in the matter of agitation and precipitation I

Device for Handling Zinc Dust.

think practice here has developed some new points which will be of interest to the profession.

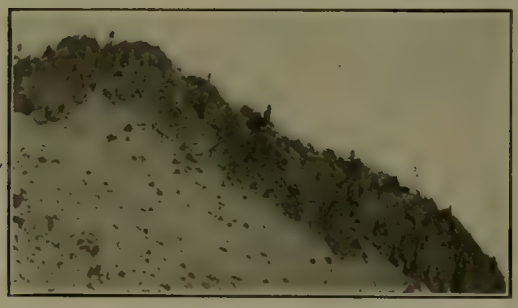
Agitation.—While Pachuca tanks are recognized as a simple, cheap, and, to a certain extent, efficient means for the agitation and aeration of pulp, they fall considerably short of what might be desired in the matter of aeration, most of the air escaping in large bubbles at the top of the column pipe with no benefit to the pulp. Observing this, efforts were directed to overcome the defect by cutting off the column pipes as follows: Out of three Pachuca tanks the column pipe in one was cut off at one-quarter distance from the top and raised, all the air thereby being brought into more general contact with the pulp from a point one-quarter distant from the top of the tank, and a reduction in the value of tailing became immediately apparent. The column pipe in No. 2 Pachuca was then cut in two in the middle and the upper half raised, resulting in still better aeration and a still further reduction in value of tailing. Pachuca No. 3 was left with column pipe full length. With the tanks in this condition several charges were run in each, the average tailing from No. 1 being 0.05 oz. per ton lower than from No. 3 and those from No. 2 being 0.16 oz. lower than No. 1 or 0.21 oz. lower than No. 3 the unaltered tank. The theory being thus apparently confirmed, a second series of five charges per tank was run with the column pipes as above described, No. 1 one-quarter off, No. 2 one-half off, No. 3 full length, resulting in average tailing as follows: from No. 1, 1.90 oz. per ton; from No. 2, 1.84 oz. per ton; and from No. 3, 2.01 oz. per ton. In all cases after 18 hours agitation. Subsequently all column pipes were cut in the middle and the upper portions raised, resulting in a corresponding reduction in the value of tailing. The cutting of the pipes has the further advantage that it is possible to commence the agitation of a tank when it is only half charged, also agitation is more easily started when for any reason it has been necessary to temporarily cut off the air, and agitation from the middle of the tank tends to prevent the settling of sand. The maximum power required for agitating a 100-ton charge of 1½ solution to 1 of pulp is 4 hp. Leaving the Pachucas the pulp goes direct to the Oliver filters, which easily handle 200 tons per day between them in a satisfactory manner, considerably exceeding the rated capacity. The solution is then precipitated by the use of zinc dust in a Merrill press, to which it is fed by gravity flow.

Precipitation.—The zinc was originally fed with the Merrill zinc-dust feeder, consisting of a 12-in. belt conveyor, 10 ft. long, operated by floats, and discharging into a cone, where emulsion was supposed to be made by the use of air. Owing to the irregularity of the operation of the belt and the uneven distribution of zinc dust on it, and the fact that the cone failed to make a perfect emulsion, a large percentage of the zinc settling and caking on the sides of the cone, the whole apparatus was abandoned, and the following equipment made, which is now in use. This equipment consists of a receiver having a diamond-shaped cross section (as described by J. S. Colbath in *The Engineering and Mining Journal* of February 26, 1910), this taking the solution direct from the press, measuring the flow, as indicated by a register attached to a tripper, and also regulating the quantity of zinc required. The receiver operates the tripper above mentioned, which makes an electric contact each time the receiver dumps. The contact current passing through a coil-magnet operates the zinc-feeder, which has a ratchet attachment for the purpose, and which is situated at the clarifying tanks, 400 ft. distant from the press. The feeder is operated on the Challenge principle, the feed of zinc being further regulated by a gate on the hopper. The zinc dust is discharged into a launder and flushed direct into a miniature tube-mill, 4 by 14 in., charged with pebbles and run at a speed of 60 r.p.m. This makes a perfect emulsion, which we find indispensable; has materially reduced our consumption of zinc, and resulted in producing a high-grade precipitate, running 80% silver, whereas formerly our precipitate ran only from 35 to 50%. This scheme has been in operation several months with excellent results. It is automatic, and the cost of operation is practically nil, the tube-mill being operated with a ¼-hp. motor.

An Interesting Stockwork

By I. F. Laucks

Several miles from Wenatchee, Washington, in a fruit raising country, is a rather remarkable gold property. The mill belonging to the property stands in the midst of a fine orchard. This same orchard is planted on the extension of the formation which is being mined. Probably few mines or mills are situated in such pleasant surroundings. The property is in Quilchuck canyon, on the west side of the Columbia river. The gold-bearing formation is a large dike, cutting across the canyon, several hundred feet wide, and said to be traceable for fifteen miles in length. Outlying portions in one place give a total width of over a thousand feet. At the point where it is being mined it stands above the surrounding country from 300 to 500 ft. The dike is a light-colored, acid rock, probably rhyolite. Its weathering renders exact identification difficult. On its flanks are sedimentaries, sandstones and shales, which are probably of Tertiary age. About a mile from the



Outcrop of the Orebody.

dike, up the canyon, is a seam of lignite which was mined some time ago. The dike has been much faulted and fractured, the faults being of small throw, several feet, for the most part. Quartz veins and stringers of all sizes, from a fraction of an inch to several feet in width, running in all directions, have filled an older set of fractures. These have again been faulted and fractured, and in some cases a new set of veins has been formed. Most of the quartz is rusty, and so frequent are the veins and stringers that the general color of the dike rock over large areas is red, stained by the interspersed quartz. Some of the stringers are high in gold, and all of them seem to contain gold. Pieces of dike rock, without any visible quartz, also contain gold in profitable amount. This combination of dike rock, and the innumerable reticulated quartz stringers, all containing gold in varying amounts, constitutes the ore of the property. There are several quartz veins large enough and of value enough to constitute a good prospect in themselves, but the plan is to work the dike as a whole. Conditions are favorable for cheap mining, as practically all there is to be done is to shoot the rock down and run it to the mill. The mill feed so far has all come from the loose rock around the sides of the dike, of which there is an enormous amount.

The mill at present consists of six Nissen 1800-lb. stamps. They fall 106 times per minute, with a 7-in. drop. Crushing through a 50-mesh slotted steel screen, 6 to 7 tons per 24 hours, and through 30-mesh, their capacity is estimated at 12 to 15 tons. The height of discharge is only 2 to 3 inches. Cams, shoes, and dies are of chrome steel. The stamps were designed for large capacity, and are used as crushers only, no inside amalgamation being attempted. The pulp is run over plates and canvas tables at present. The gold is very fine and fine crushing is necessary to a successful saving. The illustration gives some idea of the amount of weathering and fracturing which has taken place. The highest point here shown is about 500 ft. above the millsite.

THE PREMIER DIAMOND MINE

According to the *Rand Daily Mail*, the Premier diamond mine is situated on the farm Elandsfontein No. 85, approximately 25 miles east of Pretoria, near the top of the watershed dividing the Elands and Pienaars rivers, and was discovered by T. M. Cullinan, the present chairman of the company, in November, 1902. The pipe is bounded by hills of an average height of 100 ft., principally of a sandstone and quartzite formation, and these form the rim rock of the pipe. The area of the mine is equal to 3570 claims of 900 Cape square feet each. In English measurement this represents 3,561,300 sq. ft., or say 78 acres. The mine is being worked in levels or terraces, 50 ft. in depth, and in view of the area of the pipe, and the hard nature of the rim rock, it will be possible to continue the open workings to a depth of 1200 or 1500 ft., which will represent approximately 500,000,000 loads of 16 cu. ft., or say 40 years' work calculated on an output of 12,000,000 loads per annum. Nine bore-holes have been put down within the pipe area to depths varying from 300 to 1000 ft., and the diamonds extracted from the core obtained show a favorable yield throughout. It being the policy of the company to start operations without delay, two temporary washing gears were erected, comprising respectively, three and eight pans each. Work was commenced with the former in April 1903, and with the latter in January 1904. In view of the facilities afforded for working on a large scale, however, arrangements were subsequently made for the erection of an up-to-date direct double treatment plant capable of washing 20,000 loads of 16 cu. ft. per day of 24 hours, and work with this gear, which is the largest of its kind in the world, was commenced in November 1905. Up to the end of May 1908, the No. 1, 2, and 3 gears had treated 16,696,588 loads, from which 5,725,426½ carats of diamonds were recovered, equal to 1 ton, 3 cwt., 1 st. Among many other large stones, the mine has yielded the largest known diamond in the world. This stone is of the best quality, and weighs 3025¾ carats. It is now numbered among the Crown gems of King George IV of England.

The stone is a common measure of weight in many countries of Europe. The English Imperial Standard stone is 14 pounds avoirdupois.

The Cost of the Goldfield Mining Boom

By [illegible]

Eight years ago the gleaming desert in which Goldfield is situated was uninhabited, inaccessible and unknown. The sudden uprearing within this desert of a large mining community together with a railroad and great mining industry has involved a most unusual application of human energies. In general the psychology of mining is peculiar. This I suppose is due to the fact that more than in any other industry, there is room in mining for the imagination. The fortunes of mining undergo sudden and wide variations. The powers

The City of Goldfield, Nevada.

of the best developed mine are, to some degree, hidden; the results of next month's and of next year's work are, to some degree, unknown.

As a result of this uncertainty, always present, the unskillful see the industry in caricature, and an exaggerated hope of brilliant success fixes their thoughts. Such views, developed to an extreme degree, originally pervaded Goldfield. In its truest sense, the camp underwent a mining excitement. Indeed, the peculiar story of the camp is intimately woven with the story of this excitement. There were a multitude of difficulties in the way which would have turned aside or long delayed other enterprises; but here they were overcome easily and promptly by the impact of the powerful enthusiasm which accompanied the boom.

Effective as it surely was, this enthusiasm was not less illogical than it was powerful. It constituted a huge and awkward force which denied the use of reason. In its blind activities, it did much good and much harm. To estimate accurately in dollars what gains and what losses it accomplished is impossible. It is, however, possible to investigate the matter qualitatively. I propose to indicate where the gains and losses came, and to arrive at a judgment as to the debits and credits. As preliminary to the understanding of the Goldfield boom it is necessary to realize that it consisted of two unlike parts. The first of these was the maelstrom within the camp. As has been suggested above, this took the form of tremendous activity. In essence, it consisted largely of a rapid circulation of money. Money passed from hand to hand with unusual speed. It was easy to get and easy to spend. The second part was the external boom—that seductive force which caused grocers in quiet New England villages to send their good money into the maelstrom. In one way this part was similar to the first, for it encouraged easy expenditure; but in another way it was fundamentally dissimilar, for it offered no ready means of winning the expenditure back. I do not, of course, contend that the internal boom was insignificant, or that it was not primarily responsible for the external boom. I wish merely to emphasize the fact that much of the excitement within the camp was a revolution, not a progress. Much of the stir was self-neutralizing. Big gambling gains and losses, rapid changes in ownership of real estate, numerous transfers of mining stock—these, in themselves, signified little; the individual had an excellent chance to win back on Tuesday what he lost on Monday. These facts being taken account of, it is evident that the essential features of the boom may be covered in a consideration of the following: (1) The building of the town of Goldfield; (2) prospecting and developing; (3) sale of mining stocks; (4) moral effect of the boom condition.

In 1907 Goldfield had a population of 20,000 and a yearly ore production of 100,000 tons. In 1910 it

has a population of 5000 and a yearly ore production of 300,000 tons. At the earlier date the construction of the town and the development of the principal orebodies had been completed. The excess of people was therefore not required either for construction or for development. If it be assumed that the population needed varies with the tonnage produced, the actual population was something like twelve times as great as was demanded by the genuine needs of the community. In other words, eleven-twelfths of the people were on hand because of the boom. In reality the camp had from the day of its discovery been, in this meaning of the words, overpopulated. As a result, it was overbuilt. The average number of vacant buildings is about one out of three, enough in certain localities to produce a decidedly deserted appearance. There are, moreover, a considerable number of incompleted buildings. The slump in 1907 left them, with their unclad rafters, to be a permanent evidence that some persons changed their minds. The decrease in the effective selling value of real estate since 1907 is probably 75 per cent. Prices, at that time, were raised greatly above cost, and they are now much below it. The assessors' valuation of real estate in Goldfield a year or so ago was two and one half millions. It is easy from these figures to make a rough estimate of the real estate loss.

Not less certain than the fact that the desert town was overbuilt, is the fact that the region about it was overprospected. A primitive race, making it a matter of religion to dig holes, could scarcely dig more pitfalls in an age than the prospectors of Goldfield dug in five years. There are holes in the tuffs, holes in the loose wash, and holes in the summits of rocky peaks. To the mind of the excitement-stricken prospector, it did not occur that an investigation of the croppings for a distance of 100 ft. down from the apex of a hill would often render as much information as to its value as the sinking of a shaft for a like distance. In 1907, something like 200 shafts produced 100,000 tons of ore. In 1910, about 20 shafts are taking out 300,000, of which amount 5 are taking out 90%. A close calculation of the cost of fruitless prospecting is not possible. An approximation of the probable maximum is, however, sufficient. Very likely the expenditure did not exceed one and one-half million dollars. The total real loss, then, through real estate depreciation and fruitless prospecting was probably between three and four million dollars. These losses were concerned with the internal boom. The losses concerned with the external boom were of a very different sort, and resulted chiefly from purchases of mining stocks. There were about 200 companies promoted in Goldfield. Almost invariably they had a capitalization of 1,000,000 shares. Each company sold, on an average, one-half of its capital stock. The average price realized is unknown; but likely was 30c. The companies which have since had great success are included in this average, but as their original selling price was low, they bring up the average little or none. The money invested, then, in the initial purchase of the mining securities of Goldfield was something like $30,000,000. These figures indicate that the external boom was several times as costly as the internal boom. So far the losses have been expressed in money. An additional and very substantial loss, the injurious moral effect of the boom condition, cannot, of course, be so expressed. The most striking effect of this sort was high-grading. Indeed, high-grading was not less a cause than an effect. Moreover, it was an effect not only of the boom condition, but of other conditions as well, chief among which was the richness of the ore. Yet the peculiar state of mind which accompanied the boom must be regarded as an essential condition.

The Beginning of the Goldfield Consolidated.

Not over three and one-half years ago the high-grader in Goldfield was a 'perfectly good' and respected citizen. He who refused to high-grade was over nice and scrupulous, and many a man who would scorn to steal money, stole ore. Much astonishment has been expressed that such a condition should have existed. In reality its explanation is simple. The ultimate cause of the condition was the unusual excitement accompanying the hope of extreme success. This excitement was dominant. It eclipsed usual ideas and unsettled customary morailty. Goldfield got into the habit of high-grading during the days of leasing. Good miners were then not easy to get unless they were given the opportunity to high-grade. When a lease was fast expiring, it paid better to let the miner who was taking out $200 worth of ore, have $20 of it for himself, than to take out no ore at all. So high-grading was for a time actually countenanced by the owners of the ore. For the average man, the criterion of

morality is custom. What is usual and what the neighbors approve is right. In Goldfield because of the peculiar and general mental attitude nearly everyone approved. Moreover as Goldfield was isolated, the influence of outside opinion operated slowly. In a populous locality the average of morality is maintained by the diffusion of ideas. But ideas diffuse very slowly over two or three hundred miles of desert. These are the reasons why high grading became extensive and why it was not in bad repute. There is another bad moral effect less conspicuous but not less important. Goldfield has seen the making of sudden fortunes. It has had the taste of extreme hope. Not one man from each thousand is destined to have great financial success. Yet 900 out of 1000 are mentally unfitted by conditions such as existed at Goldfield for the unromantic labors which by fate they are destined always to pursue. It is difficult to get down to business and take ordinary profits, when for a year you have been dreaming of ten hundred per cent.

The effects which have now been considered are the important losses which resulted from the boom. But there were important gains as well. The mines have produced about $40,000,000. Some of the prospecting, and some of the stock investment was, therefore, very fruitful. But how much of the success was due to the boom? A useful method of arproaching this question is to consider in what way the result would have been less successful had the methods of ordinary business been applied. It is certain that the calm calculations of ordinary business would never so suddenly have established a comfortable town and a great mining industry. It would never have spent money on frenzied prospecting. Nor would it have built houses for a whimsical population which next year might migrate. But for the boom, we might still be buying water by the gallon, and extinguishing fires by primitive methods. Above all, we might still be ignorant of the existence of the Hayes-Monette orebody. In short, the boom benefited the camp by giving it the impulse for sudden development. To the owners of the productive mines, this sudden development was of enormous advantage. It is a notable fact, however, that the people who furnished the money for the boom were not those who reaped the benefit from it. The people who paid $30,000,000 for Goldfield stocks are not the owners of Consolidated. Many declare that we must have booms to develop mines. It would be more correct to say that we must have booms to develop mines at top speed. If this is an argument in favor of booms in mining, it is likewise an argument in favor of booms in other industries. It is entirely certain that, whatever the industry, the visionary attitude is very costly, and that the application of common sense is immeasurably more efficient. For the average citizen booms of any sort are excellent things to keep away from.

Minnesota furnishes from St. Louis county alone about three-fifths of the iron ore produced in the United States; the shipments during 1909 amounting to 29,282,526 tons.

A CIRCUIT TESTER FOR BLASTERS

There has always been much difficulty in detecting unexploded charges particularly in floor shots, and until recently the blaster has had to depend on his eye to determine whether all of the holes had fired or not. This is at best an unsatisfactory method because in a number of instances it has been found that the wires and tamping from the hole were not blown out although the dynamite had exploded perfectly. Although the difficulty of finding a missed hole after the blast has been fired still remains it is now possible for a blaster, with care, to determine with a great deal of certainty that each of the electric fuzes in a blast are in good condition before the shot is fired. A device known as the du Pont galvanometer or a circuit tester has been invented and placed on the market, which not only indicates whether an electrical circuit is closed or not, but also indicates, within practical limits, the amount of electric resistance in the circuit. A blaster may connect the two leading wires to the galvanometer after the holes are all connected up and the galvanometer will indicate not only whether the circuit is complete or not, but also if there is leakage through bare connections, etc., the number of electric fuses connected in series. For instance, if a blaster has 30 holes, in each of which there is an 8-ft. electric fuse, by referring to the table furnished with the galvanometer, he will see that the total amount of resistance is $33\frac{1}{2}$ ohms. If the needle on the galvanometer now indicates close to that figure, he may be perfectly sure: first, that none of the electric fuses are broken; second, that there is no leakage of current through the bare ends of the connecting wires; and, third, that the leading wires are intact. If a wire of one of the electric fuses has been broken in tamping, the blaster will get no motion of the needle when he connects it to the two leading wires. By going over the bare connections over the holes, it is possible for him in a few minutes to determine which electric fuse has the open circuit. It frequently happens that the leading wires become frayed and the insulation removed in places, and this bare wire may fall over an air or steam pipe or a rail, thereby producing a short circuit through the pipe or rail. When the blaster tests his leading wires on the du Pont galvanometer under these circumstances, it will immediately show a short circuit, and the blaster, knowing that the resistance should be calculated from the number of electric fuses he has connected in series, instantly sees that something is wrong and does not attempt to fire the blast until the wires are lifted clear from the iron. In looking for a break or broken wire in a large floor blast, the instrument can be attached successively to the double lines of bore-holes at the ends so that the line containing the break is quickly found, after which the electric fuses in each bore-hole are gone over separately. It is, of course, not possible to determine positively after a blast has been fired whether the protruding wires from any bore-hole are connected to a live electric fuse or not, as the end wires are usually stripped and crumpled together by the blast when it fires.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Cyanide Problem

The Editor:

Sir—Replying to 'Cyanide Problem' in the issue of August 13, it may be assumed that the premise in this case is "an ore, consisting of a quartz gangue, in which occurs pyrite in abundance, with a relatively small amount of galena, blende, chalcopyrite," gold, and a complex silver-antimony compound; and that the desideratum is, to extract that amount of the several metals or minerals, contained in this ore which will show the greatest profit over cost of operations. The primary conditions to be confronted are that direct amalgamation of the ore, and doubtless, amalgamation at any time, is prohibited by the presence of galena, blende, and the complex silver-antimony compound in the ore; that direct cyanidation of the ore is impracticable, due to the presence of galena, blende, complex silver-antimony compound, and other cyanicides; that any roasting treatment of the ore is prohibitively high, due to cost of fuel and other considerations. Under the conditions imposed we are confined to the process of cyaniding the ore, and as a secondary condition to the use of this method of treatment, we must 'eliminate' the cyanicides, antimony, galena, blende, etc., or at least render them 'innocuous.' To 'eliminate' the elements in the ore detrimental to cyanidation, naturally implies their removal by some mechanical means; and to render them 'innocuous' implies a change from their present state of association to a state not detrimental to the action of the cyanide in dissolving the gold and silver contained in the ore, namely, a chemical change. Now we must decide upon which method or combination of methods should be followed to 'extract that amount of the several metals or minerals contained in the ore, which will show the greatest profit over cost of operations.' As agents for eliminating from the ore, the antimony compound, galena, blende, etc., we may employ classifiers or concentrators. As an agent for rendering the antimony 'innocuous' we may add caustic alkali to the ore; or, we may crush the ore to such a size that a minimum amount of antimony and a maximum amount of gold and silver will be exposed to the action of the cyanide. In regard to the latter proposal I have read that, in Borneo, under the direction of Alfred James, good extraction of gold was obtained from an ore containing considerable antimony and arsenic, by breaking the ore to a size, varying between that of a lemon and a walnut, and treating with a very dilute solution of cyanide. In regard to the second proposal, the alkali, in combining with the antimony, also combines with the oxygen of the air; thus if the alkali-antimony compound be formed in the cyanide solution, the potency of the solution for dissolving would be diminished by the paucity of uncombined oxygen in the solution, as present in air. In regard to the first proposal, there does not appear to be any reason whatsoever that the pyrite, chalcopyrite, blende, galena, antimony-silver compound, and gold should not be removed from the gangue of the ore by concentrating tables, to almost any degree of refinement desired. Now, neglecting for purposes of discussion the last proposal, we must determine the comparative economies between crushing the ore to concentrate, followed by cyaniding the concentrate, and crushing the ore to cyanide, the addition of the alkali preceding cyanidation, or between either of these methods and a combination of them both. Naturally it is not possible here to point out the limit to which any one step in a series of steps composing a method of extraction should be carried or what combination of steps should form a method. But, provided the third proposal be not applicable, from what data we have at hand, it would seem that crushing, followed by concentration, followed by treatment of the tailing with alkali, by agitating the alkali with the tailing by compressed air, followed by cyanidation, would give good results. As must be evident, the above is but a 'speculation' upon the problem given, and is, in fact, an expression of the method of solution proposed for a similar problem, once expected to be confronted, but which finally was not encountered.

LEE FRASER.

Punta Arenas, Costa Rica, September 21.

Standard Mill Construction

The Editor:

Sir—Mill construction after more than a half century of practical experience, it would seem, should have been reduced to almost an exact science, but there are still seen the same divergence of opinions as to what is proper, or improper, construction as there was twenty or more years ago. As a consequence there is no standard of mill design. In the greater or more important features of mill design and construction there is more uniformity of idea than in the lesser details. Most engineers agree that concrete battery foundations, when properly made, are superior to those of wood, but there is still a great difference in the ideas of constructing engineers as to the best form of mortar block, the proper place and the manner of setting the battery posts, and in the method of anchoring the mortars. Anvil blocks are not, as yet, in general favor, and in some mills have even been removed after trial. The position of line shaft is one of the matters in which there is still divergent opinion. Some—perhaps the majority—favor placing the line shaft low down and back of the battery post, others place it in front of the line of mortars and beneath the amalgamating tables, still others preferring to place it on the cam-floor in front of the mortars. This horizontal pull on the cam-shaft seems to me the most undesirable of any of the several positions, notwithstanding the claims of some others to the contrary. In concentration mills is seen the same diversity of arrangement of the various machines. To some extent this is controlled by the needs of treatment due to difference

of the ores but there is much difference without real cause. Surely there must be some best way to arrange mill machinery and it would be interesting to know what it is.

MILLMAN.

Nevada City, California, October 15.

Standardization of English

The Editor:

Sir—I note the criticism offered by C. O'Brien in your issue of September 10. He is in error; my use of the word "was no Cornish localism but the subjunctive mood as expressive of the conditional. While "familiar with the lingo of the Cousin Jack," I may confess to having learned to speak our language at a great distance from the 'old county.' However, I do appreciate Mr. O'Brien's friendly comment and I am glad to see that he is interested in the subject. The pleasant tilt in which I have recently engaged before the Institution of Mining and Metallurgy here in London has, I believe, caused some of my British friends to "sit up and take notice." It is of no great importance whether my views are accepted or rejected, but it is of first-rate importance that engineers should use the language, and especially technical terms, in a thoughtful way.

T. A. RICKARD.

London, September 26.

Hardening and Tempering Drill Steel

The Editor:

Sir—Since the Steel Trust has controlled the supply of drill steel a very inferior article has been sold to the miners. The hardware merchant will tell you that the agents of the Trust simply brand the steel to suit the order, and you have to take what you get and look pleasant. Some time ago I had a quantity of this steel marked 'Canton,' which would check and crack despite the most careful treatment by experienced men. It would crack under the hammer in forging, and if not in the forging it would check in hardening and tempering. We finally learned a method that was fairly successful. It will surely be appreciated by the unfortunates who have to use such steel. It was as follows: Heat the steel to a bright yellow color and hammer into shape before it becomes black. Let cool. To harden, heat to a low red color—as low as possible to harden (you can prove this with a file)—dip vertically in the water to a depth of an inch below the surface, moving it around in circles for about twelve or fifteen seconds; by that time the steel will be chilled and hardened clean through. Now brighten on a soft pine board, sprinkled over with coarse sand or slag from the forge. The heat from the shank of the drill will generally be sufficient to draw the temper to a yellow or copper color, as may be appropriate for the rock to be drilled.

If the heat in the steel itself is not sufficient, it can be held over the fire and brought to the proper degree of heat and color to obtain a good temper. There will be little trouble with the steel if this course is followed closely.

In tempering a pick, if it is allowed to come down to a blue two or three times repeatedly before the final plunge it becomes very tough and will stand the hardest usage. Try it.

The blacksmith shop should be moderately dark to get the best results. If there is a strong light it is difficult to judge the heat of the steel.

J. A. MACDONALD.

San Francisco, October 14.

Expert Milling

The Editor:

Sir—Not long since I secured a job as amalgamator in a gold mill. I proceeded with my work as I had been taught by a millman who knew the business from the breaker to the tailing sluice, and who knew it well. After working about the mill as assistant to the millwright for a few weeks I was given a shift on the batteries, for which I had really hired. I was shown a heavy coffee cup containing the quicksilver to be used on my shift. From that cup I took the 'quick' which I fed into the mortars. For some days, or rather nights, I was on night shift. I got along all right, but one night I found the outside plates getting hard. I threw in more 'quick' and dressed the outside plates. After midnight I had to hunt up the quicksilver tank and get more 'quick' as my supply was exhausted. I used nearly four times as much as the boss millman had set out for me. In the morning he noticed that the iron flask had been disturbed and inquired of me about it when I came on shift in the evening. I told him I had found it necessary to feed more silver, and took it from the flask. He told me he had given me all the 'quick' I was expected to use and sent me to the office with a time check. There are no doubt many of your readers who will not believe this, but it is true nevertheless.

BATTERYMAN.

San Francisco, October 13.

Indications of a Mine

The Editor:

Sir—I read in the *Mining and Scientific Press* of October 1 that a man who signs his name 'Missouri' is skeptical that anyone can judge whether a mine will be good or bad before it is developed, or even after it is fully developed. I differ with this person 'from Missouri,' and can 'show him' that it can be done—even long before it is fully developed. A great many claim that mining is all chance. Well, it is to some extent, but while developing a mine there are 'signs' which, if one understand them, tell whether the mine will be good or bad. Of this fact I believe I can convince any reasonable person. 'Missouri' says if a man can tell, he would like to know. There are lots of people who would like to 'know how' if they could get such knowledge for nothing.

R. VINCENT.

Grass Valley, California, October 13.

[The original proposition referred wholly to surface indications and not to developed or partly developed mines. Elsewhere herein will be found a contribution on this interesting and important subject.—EDITOR.]

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Cross-ties to the number of 123,754,000 were purchased by the railroad companies of the United States in 1909 at a cost of $60,321,000. The chief wood used in this work was oak, which constituted approximately 45% of the total. The purchases by steam roads formed about 93%, as compared with 94 in 1908 and 1907.

The first ore from the Missabe range was shipped from the Mountain iron mine over the Duluth, Missabe & Northern railroad in 1892. The total shipments during that year amounted to 4248 tons. Since that time the Mountain iron mine has produced 17,200,000 tons. At the present time there are 92 producing properties on the Missabe range from which during 1909 were extracted 28,174,000 tons.

Tar vapors and other heavy carbon-hydrogen compounds which are the product of distillation of coal under certain treatment burn slowly, and in order to burn them nearly completely they must be kept a comparatively long time within the furnace. To fulfil this condition the furnace must be provided with a large combustion space. Such furnaces, however, are objectionable for obvious reasons. The best remedy probably is to avoid the formation of all these slow-burning volatile compounds by using the principle of the low rate of heating of fresh fuel.

To prevent any air-space in loading a hole for blasting, the cartridge should be split and then pressed carefully to the bottom of the hole with a wooden tamper. The cartridges should thus be pressed against one another, avoiding all shocks and taking good care that no earth or dust shall fall between them; the tamping should be done with sand or ordinary dry earth for the first six inches by pressing lightly with the tamper and then with clay upon which more force may be used in the ramming. Great precaution should also be taken in handling the fuse of electric detonators, for any deterioration of these articles may cause a delay or greater celerity in the explosion, or may make the shot miss fire altogether.

During the session of 1909 the Legislative Assembly of the Province of Quebec enacted some amendments to the Quebec Mining Law which are important. Under the new provisions a miner's certificate must be taken out which is valid from the date of its issue to the first January following. The price of the certificate is $10. Any holder of a miner's certificate may prospect on public lands, whether surveyed or not, or on private lands where the mines are reserved to the Crown. Nevertheless, if such holder of a miner's certificate wishes to prospect on private lands, he must first give good and sufficient security, subject to the Minister's approval, for any damage he may cause the surface owner through his prospecting.

In pouring concrete columns there is always a danger of the formation of pockets, due to large stones being caught between the reinforcing members and between the steel and the forms. Even with the greatest care this cannot be entirely avoided, especially when the columns are long and have spiral reinforcement. Such pockets, if large, may seriously affect the strength of the columns, and it would therefore seem desirable to make a thorough examination of them as soon as the forms are stripped, sounding them for holes beneath the surface, and not being satisfied with a mere superficial inspection.

Manufactures now form, for the first time in the history of our commerce, more than one-half of the total exports of the United States. In the 8 months ended with August, the figures of the Bureau of Statistics of the Department of Commerce and Labor show that out of a total exportation of $1,027,000,000, manufactures amounted to $542,750,000, or 52.8% of the whole. One year ago, out of a total export of $989,000,000 in the 8 months, manufactures contributed $475,000,000, or but 48%; 2 years ago their share was $472,000,000, out of a total of $1,075,000,000, or 44% of the total; 10 years ago, taking the figures for the entire year, manufactures formed 35½%; 20 years ago, 21%; and 30 years ago, 15% of the total exports of domestic merchandise.

Wash out the boiler at least once every month and more often if feed water is bad. Do not allow mud or scale to accumulate in boiler and do not allow oil or grease to enter boiler; these foreign substances may cause over-heating and burning of plates and result in a bag, rupture, or violent explosion. A solution of soda ash or a small quantity of kerosene fed continuously into boiler is often beneficial in preventing or softening scale; when these substances are used, open blow-off cock once or twice a day. If kerosene is used, great care must be exercised to see that it is entirely gotten rid of by allowing a draft to blow through the boiler before bringing a naked light to the boiler or allowing anyone to enter the boiler, as an explosion may ensue or the fumes may overcome the person entering.

Most mechanical stokers are designed so that the coal is fed into the furnace gradually, and therefore the rate of heating is slow. The result is that a comparatively small amount of combustible is driven off as volatile matter, and it consists chiefly of easily burning gases, most of the carbon being left and burnt on the grate as fixed carbon; very small amounts of tarry vapors are distilled, whence the success of most mechanical stokers in burning smoky fuel. As an example, on a well-operated chain-grate stoker, it takes perhaps fifteen to twenty minutes to heat the coal through to the same temperature range of 2400°F., which takes only two or three minutes in the hand-fired furnace. In general, the success of these mechanical stokers lies not in the fact that they consume smoke but that they burn the coal without producing much smoke at all.

Special Correspondence

MELBOURNE, AUSTRALIA

Chillagoe Mines — Electrolitic Smelting & Refining Co — Conditions at Broken Hill — Gold Output — Mount Lyell

The Chillagoe company is one of the most important enterprises promoted in Australia in recent years. It was mainly through the reports of A. Stewart, formerly general manager for the Broken Hill Proprietary company, that this company was evolved from the syndicate stage. The reports by Mr. Stewart on the lease areas held by the company in North Queensland gave high assays for copper in several of the concessions obtained. The result was that a company with a considerable working capital was formed and £5,700,000 was raised in debentures for the purpose of constructing railways and building a nest of smelters at Chillagoe. As showing the way in which such enterprises may be begun the company although it had not ore developed sufficient to keep the whole of the smelters at work, had to expend under the debenture deed a large sum in building the smelters. Up to the present time the showing developed has not warranted the expense and a great deal of the outlay could have been saved. The mines at Chillagoe, whatever they may have promised at the surface, have generally been disappointments. One of them, the Zillmanton, is now being worked but it has only about 40,000 tons of ore proved. When the capital of the company is seen to be £4,500,000 exclusive of the debenture debt of £57,000 on the Chillagoe railway it can be seen that the enterprise has fallen far short of all mining prospects as indicated by its capitalization. Never a dividend has been paid and two reconstructions have been made, and now the company is emerging from a mining venture into an important industrial concern. The backbone of the company is the railway and the possibilities of expansion of the customers' side of the enterprise. So with Chillagoe mines so unsatisfactory the company has recently spent £400,000 in extending its railway system to the Ethridge field. This is one of the most important private enterprises undertaken in Australia, for it means bringing under the control of the company the area of 11,000 square miles full of mineral possibilities. There are many gold bearing veins in the district containing a certain percentage of refractory ore. In saying this it is not intended to assert that the company has actual possession of the country, but that its railways and works mean that the areas are dominated by it, and that any inflow of population must swell its revenues. The bulk of the debentures and a large proportion of the share capital has been subscribed in London, and it is the sincere wish of every Australian that the development of the Ethridge will bring a return to the company. This could be assured if private enterprise were in no way hampered by socialistic ideas in Australia. As it is the company is so far out of the way of politics that it seems to have a large amount of freedom from all political influences. Besides that, it has not done well so far, and the socialist does not want the State to be burdened by anything that does not pay. He only wants the plums in the dough.

United States refiners are to lose the copper refining contract of the Mount Lyell company, Tasmania, which for many years has gone to Baltimore. The Electrolitic Smelting & Refining Co. at Port Kembla in New South Wales is the successful applicant on this occasion. This concern is the only organization of the kind in Australia, but it has already achieved a name for the purity of its copper. That it should be able to beat all competitors when tendering for the refining work is a fact of no small interest. Australians patriotically are delighted to see these works expand. A considerable amount of additional capital will have to be sunk to provide for the Mount Lyell work, but this money will be at once forthcoming. The real proprietors of the works are the Mount Morgan company, which is now vying with the Mount Lyell company in its output of copper. The bargain is a good one because the Mount Lyell blister copper contains silver, whereas Mount Morgan blister copper does not. So no chemical operations will be facilitated. Unrest at Broken Hill is still creating anxiety. The trades unions there know that their agreement with the mines for a scale of wages expires at the end of the year, and their desire is to be able to present a case to the Federal Arbitration Court which will induce that body to increase wages. The mines are said to be consolidating their strength but past jealousies have not altogether vanished. The Broken Hill Proprietary Co.'s mine is still closed and 1900 men consequently are out of employment. The company will not work with lead at the present price. The other companies are believed to be willing to renew the existing wage agreement for five years if the men will consent, but there is a strong agitating element in labor circles which is opposed to any renewal.

The gold yield of Australia shows no signs of improvement though evidences at some of the leading centres are somewhat more cheerful. In Charters Towers, Queensland, some of the deep mines and the outlying districts promise better. In Victoria the alluvial industry is depressed and yields are lower than usual as deep ground is being developed but in Bendigo and in some outlying parts of Ballarat some of the neglected areas are being worked with encouraging results. Any further development in this direction will check the falling goldfield and find employment for out of work miners. The Australian gold yield for the past eight months of this year compares with the previous years as follows:

	1908	1909	1910
	Fine oz.	Fine oz.	Fine oz.
January	46,143	40,556	52,057
February	57,732	40,175	42,228
March	58,786	75,489	64,370
April	35,838	49,611	30,622
May	69,682	44,465	49,979
June	61,253	71,209	56,284
July	46,625	42,616	41,218
August	63,726	54,182	45,040
Total	439,785	418,503	381,798

The Mount Lyell mine as a copper producer retains its pre-eminence in Australia. The way in which the ore has maintained its richness in the company's North Lyell mine and has continued in the schist has astounded mining men when the contraction of the shoots at above 750 ft. are remembered. But the 750, 850, and 1000-ft. levels have been veritable store houses of wealth. So the expectation was that the shoots being so well defined and showy would not diminish at 1100 ft. The ore is found on the contact of the conglomerate rock and the schist and one big ore shoot at least has failed to turn up at the bottom level, while an intermediate level 50 ft. above has only alighted upon a small vein. It looks as if an orebody ranging for over 30 ft. in width has tailed out. The other shoots that have been cut at depth show some sign of contraction so it has to be admitted that developments at 1100 ft. are not altogether satisfactory. While this is so the company is doing a good deal of prospecting at the Mount Balfour field, some little distance away from Mount Lyell, with moderate results. The copper ore is rich but in a quartz gangue and has to be proved to carry down. Then the company has its superphosphate enterprise which has been a high success the sulphuric acid being manufactured from the low-grade pyrites from the Mount Lyell mine itself and from a splendid deposit of pyrite close to Zeehan in Tasmania.

Litigation of the most extensive nature is pending over the patent rights to the so-called flotation processes. The pioneer was one Potter, a brewing chemist and his 'hot acidulated solution' patent has been upheld by the High Court of Australia. Then there is the Elmore vacuum patent, the Minerals Separation (Cattermole patent), and the De Bavay 'surface tension' flotation process. The Broken Hill Proprietary Co. uses the Potters process, the Sulphide Corporation, the Minerals Separation, the Zinc Corporation the Elmore, and the Amalgamated Zinc the De Bavays.

Potters people are attacking the Minerals Separation company and the Sulphide Corporation the Minerals Separation is tackling the Amalgamated Zinc (De Bavays), which holds an option over the Potters, and the Elmore people are understood to be proceeding against the Minerals Separation company. The right thing to do of course would be for the contestants to amalgamate, but they are all cock-sure. The prize in front of the winner is immense, and lawyers and patent agents don't, as a rule, advise a non-fighting attitude.

TORONTO, CANADA

Cobalt Mines. — Porcupine. — Gowganda. — Government Geological Work.

The principal feature lately in connection with Cobalt has been a discovery on the Little Nipissing, which has had the unusual effect of sending the stock up several points on a generally quiet market. The discovery was made 800 ft. out under the lake at a depth of 236 ft. in the drift off the winze, which is now 50 ft. farther down. The vein is 2 ft. wide with a 7-in. pay-streak yielding rich ore. The find is in the Keewatin formation, and in view of the results of development in this formation in the Temiskaming this is regarded as favorably significant. The latter company has also been coming into favor recently, good ore having been extracted at the 500-ft. level. The anuual report of the Kerr Lake is somewhat of a disappointment as foreshadowing a reduction in the dividend rate unless production is increased. The net revenue of the year ended August 31 was $1,542,194, and the expenses $343,974, leaving a balance of $1,198,220 out of which dividends were paid amounting to $1,050,000. The surplus of $148,220 shows a decrease of $480,827, as compared with the previous surplus. The total production of silver was 3,046,295 oz., and the total cost of production 13.72c. per oz., the mining cost being 7.54c. per oz. At the Ophir the shaft is down 300 ft. with a 10-ft. sump, and active work has been started cross-cutting at the 300-ft. level to pick up the veins opened on the 200. The Hargrave is driving a drift from the main workings of the 375-ft. level on No. 3 vein to reach an ore-body which has been worked on the Kerr Lake up to the Hargrave line, yielding rich ore. Shipments are being con tinued from No. 1 vein. The Provincial shaft No. 2 now down 200 ft. is being sunk 75 ft. farther. J. Reddington, formerly of the Coniagas, is in charge of the mine which will shortly make shipments of high and low-grade ore. The Trethewey has declared a 10% dividend being the first payment this year.

The Porcupine camp is attracting more attention just now than Cobalt, several important transactions in claims indicating that large capitalists are being interested having been reported though details are not available. A recent investment by a syndicate of British capitalists is stated to involve about a million dollars. At the Crown Chartered mine development is progressing rapidly. A cross-cut is being run at the 70-ft. level to pick up a rich vein found on the surface. On the Armstrong-McGibbon property immediately adjoining a vein with a good showing of gold has been found, which has been traced across the Crown Chartered. Several of the mine-owners are now ordering machinery in view of the approach of cold weather which will render it possible to bring in heavy loads over the winter roads. The owners of the Vipond have purchased a plant which is now on the way, and the Foster, the Dome, and others are arranging for equipment.

Activity prevails at the Gowganda camp. The Reeves Dobie, the shaft of which is down 215 ft., has bought about 20 tons of machinery including a mill with four Nissen stamps. The plant is not in operation, but when it starts is of sufficient capacity to supply some of the other properties with compressed air. The company has bought 15,000 tons of milling ore ready for concentration. The Millerette is preparing to put in a concentrator. The Boyd-Gordon is getting out good ore. Several finds at the Bartlett have been reported as the result of trenching operations. The latest discovery averages two to four inches in width and contains 3000 to 4000 oz. ore. There are also good reports from the Elk Lake district, where the Moosehorn and Silver Alliance are both preparing to make shipments of high-grade ore.

The exploring expedition sent by the Quebec Government included J. C. Gwillim, professor at Queen's University, Kingston, and A. E. Barlow, of McGill University, Montreal, has returned with a large assortment of mineral specimens after spending over three months in the wilds. These will be assayed and tested, and until the results are known and reported the members of the party are disposed to be reticent in expressing any definite opinions as to the mineral value of the region, beyond a general statement that some of the rocks appear to be highly mineralized. M. B. Baker, professor at Queen's University, commissioned by the Ontario Bureau of Mines to report on the alleged discoveries of coal on the Metagami river in northern Ontario, has found them to be practically valueless commercially, being merely a poor quality of lignite, much broken and folded, and non-continuous. Work at the Brazeau coal mines in Alberta to the west of Edmonton, in which the Canadian Northern railway is extensively interested, has been suspended. The reason is that the plans of the railway for a line to reach the coalfields were not approved by the Canadian Railway Commission, and that they could not therefore proceed with the construction of the road. The mines have been closed until spring.

GOLDFIELD, NEVADA

Bullion Output.—Consolidated Improvements.—Florence.—Combination Fraction.

A statement of John L. Considine, the Nevada State license and bullion tax agent, who has been in Goldfield on official business, declares that the bullion production of the Goldfield district for the past quarter was nearly 50% greater than for the preceding quarter, and that of the Tonopah district exceeded the prior similar period by approximately 100%. He predicts that the current year will establish a new record in both districts for the volume of their bullion output. The Goldfield Consolidated Mines Co. is reported to have been treating at times lately a tonnage closely approaching 900 tons per day with the usual high recovery of gold. New installations of hoisting and other machinery and construction of new departments, are nearing completion and all will be finished before the end of this month when some heavy items of expense will be eliminated and important economies effected in the use of the new departments, particularly by the aid of the storage battery plant. This will obviate the possibility of extended interruptions in operating hoisting machinery and lights through the shutting off of the power supply from the main line that brings the current from Bishop creek. Electric storms in the mountains through which the line passes have frequently caused the burning out of transformers and brought about a complete cessation of all such operations for several hours at a time. The storage battery plant will carry a normal load of 2500 hp. and will permit of the continuous lighting of all parts of the plant and the working of hoists for several hours without any power from the main supply line. The management is now preparing to install three new electric hoists, that at the Clermont to be of 250 hp., and those at the Mohawk and Laguna to be of 150 hp. each. These will replace steam power at the Mohawk, compressed air at the Clermont, and a small electric hoist at the Laguna. Other new departments in course of construction include an electrical supply building, transformer houses of large capacity for distributing the power to various points, a new and enlarged refinery building at the mill, a round house for the engines of the company's standard-gauge railroad, and a complete assay office and chemical laboratory. The recently exposed orebody on the 1000-ft. level of the Clermont is said to be maintaining its early promise and the drift has progressed for over 100 ft. in ore along the strike of the vein. The relation of this ore-shoot to that originally found on this level, farther to the north and east, has not yet been determined but the ore,

ave to be crossed [illegible] and connecting with the shaft of the Red Top. It is expected that the ore encountered in that of the Mohawk will be similar to that of the body found above the 500-ft. level. Thus far the extent of Contact ore bodies will be shown only by the level to demonstrate the extent of the ore discovered. A good showing is being made in the contact between the Mohawk and Red Top shafts and now opened on the 600-ft. level 150 ft. below the point of first discovery. Some of the richest ore mined recently on Consolidated Territory has come from the upper levels of the Combination mine in territory west of the main workings and near the January. Excellent results have attended the opening of the great Hampton vein on the deepest levels and at a depth of more than 100 ft. below the floors of the Hampton stope.

The Florence Goldfield company has completed the work of enlarging the main shaft to the bottom, a depth of 530 ft. and the shaft has been retimbered throughout. Pipes have been extended to the bottom from the compressors and machine drills will at once proceed to sink the shaft to a depth of 1000 ft., opening stations and installing skip pockets and ore bins at intervals of 50 ft. Two automatic skips of three tons capacity are being installed and are interchangeable with cages. Waste will be hoisted from the deeper levels to those above and will be used in back filling the abandoned and worked out stopes. The mill is treating from 140 to 150 tons per day and while the mill heads have been below the normal it is announced that treatment is being effected at a low cost and a satisfactory profit being made. From all parts of the mine ore will be hoisted through the main shaft directly to the bins and the aerial tramway will be abandoned as ore from the Little Florence lease workings and those of the old Rogers lease can soon be trammed to the shaft on two or three levels. Work is in progress at the northern part of the Florence near and under the workings of the bonanza Reilly lease where a large body of good milling ore has been exposed on the 350-ft. level.

The Combination Fraction continues to treat from 50 to 80 tons per day at its leased mill and development in the mine is said to be yielding satisfactory results, particularly on the 500-ft. level. A report that the Nevada-Goldfield 20-stamp mill, leased by the Fraction company, was to be taken from that company and leased to the Jumbo Extension company was apparently inspired by the New York firm of brokers who have been conducting a bull campaign in this stock and who were raided a short time ago at the instance of the postoffice authorities. It is said that the estimates of ore in the Vinegerone fraction are greatly exaggerated.

BUTTE, MONTANA

International Smelting Co.— Anaconda. — East Butte. — Boston & Corbin.

According to talk of mining men who have smelter arrangements with the International Smelting Co. and allied smelting interests like the Amalgamated, the fight between the International and the American Smelting & Refining Co. is more bitter than the public has been understanding. With the erection of an International smelter in the Ely district, as contemplated, every field of the A. S. & R. except Colorado will be invaded by the new smelting company. Colorado is not an inviting field for the Cole-Ryan interests, as ore production has fallen off so greatly there that the Guggenheims can operate only three of their seven furnaces in that State. The International and its allied interests now have the big smelter at Anaconda, one in Great Falls, the new plant at Tooele, Utah, the Calumet & Arizona at Douglas, Arizona, and the Cole-Ryan plant at Cananea, Mexico, these covering the entire field from which the American Smelting & Refining Co. draws its ores. When the latter had a clear field its charges for ore treatment were high, allowing a profit of $4 to $6 per ton. The excessive smelter charges made many enemies among Western miners, and the International interests have a big advantage in that fact alone, while its smelting plants are all new and modern. With these advantages the Interests should be satisfied with profits of $1 to $2 per ton, and its purpose evident, is to prevent the American Smelting & Refining Co from renewing any of its old and more profitable contracts. The days of enormous smelting earnings are over. The best contract the American Smelting & Refining Co has left is that of the Utah Copper Co. and it is said that the profits made by the Bingham company are enormous and would shock stockholders of the Utah Copper if they knew their extent. The International interests expect to treat about 5000 tons per day of custom ore. At a profit of only $1 per ton it would amount to $1,825,000 in one year. It is expected that this will more than offset the tonnage the American Smelting & Refining Co will lose upon which it has been making a profit, at $4 per ton, of $9,125,000.

B. B. Thayer, president of the Anaconda Copper Mining Co., is in the city inspecting the properties of the company. Mr. Thayer has only just started his work of inspection and therefore is not in a position to give out any information as to the condition of the mines, although he did say that he expected to find them all in excellent shape. "The copper market conditions are slowly improving," he said in reply to a question, "and I don't believe it will be many months before the market is nearly normal again. The consumption of copper today is the largest in the history of the world, and in both England and Germany the demand is increasing. All the large producers have recognized the necessity for a little ease up in the production and this is already having the effect of considerably reducing the surplus. This together with the increase in the consumption will mean that it will only be a few months before the surplus is practically wiped out. The copper market of the future looks bright and when once the mines get back to their normal output I don't believe a necessity for a curtailment will arise again, at least not for a long time anyhow." The St. Lawrence mine of the Anaconda group is to go deeper. A crew of men is now engaged in sinking the shaft to 2300 ft., which is 200 ft. below the present level. Although the mine is not hoisting any ore, quite a force of men is at work between the re-timbering of the shaft and the shaft sinking. The work of securing a good foundation for the new ore-bins to take the place of the ones which fell down a short time ago, has been proceeding rather slowly and it is believed now that at least two months will elapse before the St. Lawrence will be in a position to resume operations.

One of the furnaces of the Pittsmont smelter of the East Butte company has been closed, due to the fact that the Butte-Ballaklava and Ticon companies are not shipping the ore to the smelter they formerly did owing to the actions brought against these companies by the Anaconda company which caused considerable curtailment in the output of the mines of the companies named. Previous to the forced curtailment of the Butte-Ballaklava and Ticon mines the two concerns shipped in the vicinity of 6000 tons of ore per month to the smelter. The one furnace now being operated at the Pittsmont is treating some custom ore and only enough from the company's own mines is being hoisted to keep the furnace up to its capacity. Development is going on quite extensively and a large amount of ore is being blocked out, but no attempt is to be made to increase the production until there is an improvement in the market conditions. It is stated on very reliable information that the East Butte is earning more than operating expenses, which is considered very satisfactory under existing conditions. There is no authentic information yet forthcoming from the Butte & Superior as to how the bonds are being taken or whether W. A. Clark has consented to accept the offer of the directors to treat a certain quantity of ore provided he will take his full quota of bonds as allowed him in proportion to the amount of stock he holds. Mr. Clark appears to be acting in the matter in a kind of indifferent manner, due no doubt to the fact that when he offered to put a large amount of money into the treasury of the company his offer was rejected as the conditions were not con-

sidered acceptable. At the time in question he promised to treat the ore of the company if given him and guaranteed a certain net return, much greater, it is said, than the company was receiving from the treatment of the ore at the Basin concentrator. Mr. Clark has a lease on the concentrator part of the reduction works formerly owned by him but dismantled after being purchased by the Amalgamated Copper Co. The ore from his Elm Orlu mine is not nearly enough to keep this concentrator supplied.

The Boston & Corbin company which operates in the Corbin district, has enough money in its treasury to carry on development for a year without shipping a single ton of ore. However, it is believed that the company will ship regularly in the near future as some fine orebodies have been opened. The management is highly pleased over cutting the Bertha vein on the ninth level. It was discovered 250 ft. farther east than any ore yet found on the upper levels and is said to indicate that the ore-shoot on the ninth level should be at least 1500 ft. long as against 550 ft. on the third, 900 on the fifth, and 1250 on the seventh. On the upper levels the vein averaged from four to five feet in width, whereas on the ninth, so far as opened, it is about 11 ft. wide. The force in the Barnes-King mine and mill has been increased from 25 to 40 men. The Keating Gold Mining Co. in the Radersburg district, which is at present shipping ten cars of ore per week to the Pittsmont smelter, expects to double that amount in the very near future. The development is reported as encouraging. Some copper ore of a high grade has recently been found, but there has been no decrease in the gold value.

NEW YORK

Influences on the Market.—Inspiration.—Calumet & Arizona-Superior & Pittsburg Consolidation.—Cactus.

The elements which have been retarding market progress, uncertainty as to the action in regard to the tariff, the coming Supreme Court decisions, the political campaigns in progress in the various States are still making their weight felt, though there are many strong indications of real recovery the moment conditions will permit of a broadening of market operations. The volume of trading on the New York Stock Exchange is increasing materially and there is much impatience expressed generally that such a deadlock as exists at present should maintain an unbroken hold for so long. In the mining markets the October report of the Copper Producers' Association was received with much acclaim, as a demonstration of the success of the curtailment policy. A decrease in surplus of 20,087,536 lb. compared with stocks on hand September 1, showing a net increase as compared with January 1, of 7,027,603 lb., has already given courage to the producers and strengthened their theory as to the stabilizing of the metal market. This better feeling created has been reflected in the stock issues and some strong advances have been made. Many followers of the copper list lost heavily by reason of the Ely Central collapse.

It has been evident for some little time that there were some developments in Inspiration. An advance of over three and a half points was made without apparent crowding and without any concurrent news from the mines. The shares sold above $10 and the issue was the feature of the market. It now transpires that a deal has been completed for the $2,000,000 of stock remaining in the Inspiration treasury, and another step toward a final merger of the porphyries made at the same time. The 200,000 shares of stock mentioned was taken at par, $10, which was considerably above the current market price at the time, by a group of copper interests, including Hayden, Stone & Co., who act for the Guggenheims and who were active in the promotion of Utah and Nevada Consolidated, and who now look after the financing of Ray Consolidated and Chino. Thompson, Towle & Co., who have acted for the principal financial interests in Inspiration heretofore and in Mason Valley, also have a large share in this underwriting. The trade is important, not because of the amount involved, but more particularly because it marks the growing community of interests in copper. Every important step, in the financing of the principal developing coppers, made during the past year has been directly in line with plans for eventual huge consolidations or toward such a growing common interest as will in the end render the copper merger a mere outward formality. The deal just described brings the Inspiration, which adjoins the Miami, at Globe, Arizona, and the Mason Valley at Wabuska, Nevada, definitely into the Utah Copper Co. family. In looking over the important developing coppers there is hardly one left now which is not definitely allied with some one of the larger copper interests, and it is easily seen that by process of elimination such group of producers is being constantly reduced. Inspiration's treasury is provided for at least two years to come, and the immediate plans are for the erection of a 5000-ton concentrating mill to go into operation as quickly as possible. Developed ore is said to amount to 10,000,000 tons, with a probable tonnage estimated at 40,000,000 to 50,000,000 tons.

It will be remembered that when the producers were conferring in London, a share in the negotiations was at all times credited to the Rothschilds; the latter holding control of the Rio Tinto of Spain, and being parties to the curtailment agreement, part of which was mentioned so encouragingly and so diplomatically denied almost in the same breath after the conferences were closed. Evidently the Rio Tinto management is curtailing in all directions. Production has been cut some 15%, and now dividends are reduced from 30s. per share six months ago to 25s. for the current distribution, which is practically in the same ratio.

In the annual report of the Rio Tinto Company, Ltd., the directors take a very hopeful view of the situation and express the belief that working in conjunction with the American producers, the curtailment policy now in force will soon strengthen the industry and remove the depressing element of overproduction. The output for the year is estimated at 4,480,000 lb. of copper. A special meeting of the stockholders of the Braden Copper Mines Co. has been held and the issuance of the $2,000,000 second-mortgage bonds authorized. Of these one-half are to go to the shareholders at par and the proceeds devoted to immediate enlargement of the company's plant. The balance of the bonds are to be held until operations warrant further expenditures; among other things, the contemplated erection of a leaching plant. There is some harsh criticism made of the Federal Mining & Smelting Co., which controls the lead-silver output of the Coeur d'Alene aside from the Bunker Hill & Sullivan property. As in the case of the Granby, the shareholders have been in receipt of dividends regularly, but have had very little information, only to wake up to a situation where diminished ore reserves compel the development of new ground or an eventual cessation of profitable work. This is not in itself so much ground for complaint, since every mining property must sooner or later reach this stage, but while the present report of the Federal Mining & Smelting Co. is ample in detail, it conveys the true state of affairs to the shareholders a little tardily. In the meantime, not only the ore reserves, but the working capital has diminished and the developing of new properties must call for the expenditure of considerable sums. In the case of the Granby it cannot be said that the recent resignations cleared the air. The public impression seems to be that such resignations were accepted in the interests of peace. The reports on the property have not been at all satisfactory, and the undertaking of the management to acquire and exploit new ground in the hope of finding new orebodies is recognized as highly problematical. For the present at least, Granby must be counted as having but a few years of life, after which its splendid plant will be without ores. The salient fact emphasized in these occurrences is, that if the shareholders were vouchsafed the important vital information to which they are entitled, there would be fewer disgruntled stockholders and little or no necessity for humiliating resignations under fire.

Conditions at the Greene Cananea are improving. The long task of rebuilding the scrap heap turned over by

[illegible] Cactus [illegible] the Miami [illegible] Cactus will be ready to handle the Miami ore [illegible] the two properties can be made and the output of the Superior & Pittsburg property [illegible] the Phelps Dodge interests will be increased so that the plant will be running at capacity. James Douglas of Phelps Dodge & Co., and L. D. Ricketts of the Greene Cananea have just completed examinations and reports upon the Cactus & Arizona and the Superior & Pittsburg. These reports are to be used as a basis for a merger to be worked out between the two mines. There has been some rumor [illegible] as to the ratio of exchange between the larger holders in the two companies. Cactus & Arizona owners demanding four shares for one, the Superior & Pittsburg interests offering two shares for one. To adjust these differences an independent report was decided upon. When the consolidation was first considered it was thought the Chemung would be included, but as yet there has been no definite announcement in this regard.

The Eastern holders of Cactus stock are somewhat dismayed by the recent developments at that property as outlined in the report of C. W. Pritchett, consulting engineer. The marked effect has been a decline to 61c. from a high figure of $7 in January last. The Cactus is ten miles distant from the Miami. The orebodies as described by Mr. Pritchett are fairly large in area, but have not been in depth. It will require some months of drill work to fully determine whether Cactus is to make a mine or not. The apparent failure of the work so far does not mean that the property is to be classed wholly as a disappointment, as only a small part of the Cactus territory, which consists of 650 acres, has been systematically prospected. The deal between John T. Milliken, of St. Louis, and the Consolidated Gold Fields of South Africa for the sale of a controlling interest in Mr. Milliken's Golden Cycle mine at Cripple Creek has been definitely declared off. However, Mr. Milliken and his associate, Thomas H. Rea, of Chicago, have succeeded in interesting the Consolidated Gold Fields people in the new camp of Porcupine, having sold them two claims aggregating 320 acres. At the same time the Consolidated Gold Fields has greatly broadened its field of operation by acquiring a large interest in the Oro Grande company at Guanajuato, Mexico. The Oro Grande is a recent organization of the Securities Corporation, Limited.

LONDON

Consolidated Gold Fields Groups. — Consolidated African Copper Trust.—Bechuanaland Exploration Co.—Penhalonga Company.

One of the most interesting groups of gold mining companies owned in London and operating in New Zealand is that of the Consolidated Gold Fields of New Zealand, which was formed in 1896 to acquire properties in the Reefton district of New Zealand from David Ziman. The chief mine operated by this company is the Wealth of Nations; the Progress and the Blackwater mines were floated as separate companies. Ernest W. Spencer is general manager for the group of mines. During 1909 the Wealth of Nations treated 15,577 tons of ore yielding bullion worth £22,481 by amalgamation, and the cyanide plant treated 9590 tons and produced bullion worth £5877. The total yield was £28,358, or 36s. 5d. per ton, and the cost was £12,408 or 15s. 11d. per ton, leaving a profit of £15,950 or 20s. 6d. per ton. The reserve on December 30 was estimated at 36,000 tons, but Mr. Spencer points out that the ore is difficult to measure. During the year a tube-mill was erected, but the accessory slime-plant was not completed until after the close of the year. The company also owns the Golden Fleece and Humphrey's Gully mines, which are let to tributors, and £2916 was received from this source during the year. In addition £14,005 was received as dividends from the subsidiary companies. The net profit for the year was £29,607, out of which £4004 has been written off for depreciation, and £12,118 has been distributed as dividend, being at the rate of [illegible] since the close of the year [illegible] dends have been paid. The Wealth of Nations is a small mine and it is advantageously situated for it is not [illegible] the capital [illegible]. The directors call attention to the fact that the founder's share will soon be drawing one-quarter of the profits, according to the articles of association, the founder takes 25% of the profits after 10% has been paid on the ordinary shares. So far £7000 has been paid in cash and 10% in shares in the Progress mine and the directors are in favor of exchanging the founder's share for 50,000 ordinary shares. During the year L. Ehrlich has been elected a director, and E. T. McCarthy is acting as David Ziman's alternate on the board during his absence in New Zealand.

The Progress Mines referred to above is a subsidiary of the Consolidated Gold Fields of New Zealand and was floated in 1896. During the last few years the development has not been sufficient to keep the mill in which there are 65 stamps, fully employed. During 1909 the battery treated 35,414 tons, producing gold bullion worth £12,978, and the cyanide plant treated 25,025 tons of sand with a recovery of bullion valued at £9052. The total receipts were £52,030 or 29s. 5d. per ton, and the working cost was £46,123 or 26s. 3d. per ton, leaving a profit of £5606 or 3s. 2d. per ton. Other expenses were administration £4977, taxes £2394, depreciation £1336, and expenditures on development £1572. On the other side of the account are dividends on Blackwater shares, £1346, and items of interest and profit on the sale of shares, and the final result of the year's operations was a loss of £1894. The year commenced with a balance in hand of £28,141, so a dividend of 5%, absorbing £13,750, has been paid and £12,496 carried forward. The smelter for the treatment of concentrate, slime, and accumulated residues was completed toward the close of the year. This material contains a good deal of arsenic and antimony and requires careful roasting.

The Blackwater Mines, another subsidiary of the Consolidated Gold Fields of New Zealand, is fulfilling the promise made on flotation in 1906, and the developments and the results of metallurgical work are highly satisfactory. Milling commenced in August 1908. During the year 1909, the ore sent to the mill was 29,955 tons and gold worth £66,712 was recovered by amalgamation; the cyanide plant treated 19,635 tons and produced gold worth £6569. The total yield was worth £73,281 or 48s. 11d. per ton, an increase of 10s. per ton over the figures contained in the report for 1908. The cost at the mine was £25,221 or 16s. 10d. per ton, leaving a profit of £48,060 or 32s. 1d. per ton. Out of this, London expenses, rates, and taxes were paid, and depreciation and development were allowed for, so that the net divisible profit was £36,853, and, after deducting £6744, the adverse balance a year ago, £30,109 remained to the credit of profit and loss. The dividend absorbed £12,498, being at the rate of 5%, and £17,610 was carried forward. The ore reserve on December 31 was 69,000 tons; owing to the irregularity in the width of the vein it is not easy to make an estimate of this. The country rock also causes difficulty owing to its friable nature. The tube mill started work in August 1909 and the slime plant was completed later. The latter has not yet got to work owing to lack of power, and a gas plant is being provided to make up for the deficiency of the water-power on which the mine depended.

The Consolidated African Copper Trust was formed in 1902 to acquire a number of copper properties in various parts of Rhodesia and adjoining countries belonging to the Consolidated Gold Fields of South Africa, the London & Johannesburg Trust, and other groups. The control was in the hands of the first named. So far the chief subsidiary flotation has been the Edmundian Copper Co., which was formed to acquire the mine of that name over the border in Mozambique territory. The Consolidated African Copper Trust has been in financial difficulties for some time owing to the development of properties taking more money than was expected and owing to difficulties at the Edmundian due chiefly to faulty construction of plant. In order to put the company on a sound basis a scheme of recon-

struction has been proposed, and accepted by shareholders, whereby the London & Johannesburg Trust guarantees £75,000 of new capital and acquires the control. By this scheme the shareholders take 558,000 new shares of 5s. each in exchange for a similar number of £1 shares; 300,000 new shares of 5s. each are being offered for subscription and will be absorbed by the guarantors or the shareholders, the subscribers having a call at par on an equal number of shares for two years; 160,000 shares are being issued in satisfaction for loans advanced and 80,000 are being held in reserve. The loans were advanced for the purpose of developing the Umkondo mine and for keeping the Edmundian company going. The future policy as outlined by H. A. Piper is to keep the Edmundian mine in order, and to bring the Umkondo and Alaska properties into a shape suitable for flotation. Mr. Piper, though dissatisfied with the Edmundian plant, thinks highly of the mine. As regards the Umkondo, which is in the Victoria district, faults and dikes have interfered with development, and capital is required for further work. The reserves are estimated at 90,000 tons averaging 8%. The Alaska property contains 300,000 tons of 3% ore and a flotation method of concentration is to be adopted. A number of samples will be crushed and treated by several methods to ascertain which will give the best results.

Another development company concerned with copper properties in South Africa is the Bechuanaland Copper Co. This company was formed in May 1909 by the Bechuanaland Exploration Co. to acquire the license to work the Bushman, and other claims, 120 miles southwest of Bulawayo. The license is held from the British South Africa Co., which takes 50% of the profits. The capital of the company is £135,000 in 270,000 shares of 10s. each. The purchase price was £10,000 in cash and 30,000 shares; 120,000 shares were offered to the public, and were underwritten partly by the promoters and partly by L. Hirsch & Co., whose consideration was a call at par on the remaining 120,000 shares. The properties are situated on old workings and operations have been confined so far to the Bushman. The development work was started by S. C. Dyer and afterward let on contract. E. Jorissen is the consulting engineer. During the year ended May 31, 2382 ft. of work was done on eight shafts and four levels. Mr. Jorissen shows that the sulphides have been distributed throughout dolomite and quartzite by means of veins of pegmatite and that the ore is found in lenses. In many places galena has replaced the copper sulphides; calcite, graphite, and oxides and carbonates of copper are also found. He reports that the copper content varies, and he is of opinion that while the conditions are generally promising, much more prospecting and development will be required before the economic value of the deposit can be ascertained. As regards the graphite, this is found to exist in large enough amounts to give it a commercial value.

In a recent letter I gave an account of the condition of Penhalonga company which owns gold properties in the Umtali district of Rhodesia and is in the control of the Anglo-French-Farrar group. I mentioned that shareholders had not responded to a scheme for reconstruction based on the recommendations of H. A. Piper, the consulting engineer, and C. R. Pinder, the late manager. Another proposition has now been put before shareholders and adopted. This is a drastic reconstruction for both the debenture holders and shareholders. The capital of the new company is £110,000 in shares of £1 each; of these 66,450 go to the debenture holders, in the proportion of 1 share for each £3 debenture; 13,750 are allotted to present shareholders at the rate of 1 for every 20 shares in the old company; 27,500 are being offered to shareholders at 10s. each to present shareholders; and the remaining 2300 will be held in reserve. The issue of 27,500 new shares was guaranteed by some of the leading shareholders, so the success of the scheme was assured. This will provide working capital to the extent of £13,750, and the company has assets sufficient to bring the available funds to £21,000, the amount considered requisite for the further carrying on of development.

SALT LAKE, UTAH

Ohio Mill. —Bingham Butte Mining Co. Consolidation. — Bingham Mines Co.—Mining Suits.

The unusual records for tonnage which have been made by the Ohio mill have all been eclipsed by a recent day's run in which 2096 tons were put through. The rated capacity of the entire mill, only one-half of which is equipped, is only 2250 tons so that this one-half is handling almost as much as the entire plant was designed for. As pointed out in a recent letter the Ohio is well designed for crowding but there is some doubt as to whether the process is not being carried too far. The Bingham Butte Mining Co., of Bingham, has been reorganized as the Montana Bingham and equal exchange of stock in the two companies made. The reorganization was merely a matter of form. This company is driving an adit in the hopes of opening the Quinn fissure which cuts through the Utah Copper pit. It has been driven 400 ft. to date and it is expected to cut the fissure within the next 200. The work on the adit of the Utah Metals Co., which is allied to the Montana Bingham, is progressing at the rate of about four feet per shift, one day's work recently covering 13 ft. 8 in. The 1000-ft. level of this property is being cleaned out for the purpose of prospecting some of the fissures cut on the upper workings. Work at the Old Jordan, which was closed down while all of the machinery was given a thorough overhauling, has been resumed. It is generally understood that it is the intention of the company to increase production from the mine and that the capacity of the zinc plant at Midvale will be enlarged accordingly.

The moving of the buildings of the Bingham Mines Co. has been completed and Copper Center gulch is now open to the Utah Copper Co. as a dumping ground. The removal of the buildings makes it necessary for the company to extend the Niagara adit as a working entry and it will be about three months before the mine is shipping again.

Arguments in the case of the Silver King Consolidated *v.* Silver King Coalition have been begun in the local Federal court and the end of the long-drawn-out case is in sight. The suit is for an accounting for ore illegally extracted by the defendant company and involves about $5,000,000. Defendants have admitted that the ore was extracted and the only question seems to be as to the amount of damages. The case will be appealed in all probability. A similar suit has been brought by the Moscow Bonanza against the Moscow. The shaft of the latter is within a few feet of the boundary line with the Moscow Bonanza and the latter company alleges that ore has been taken from its property and hoisted out of the shaft. The Cedar Talisman has made a discovery of 50% zinc ore on the 125-ft. level. The vein will be followed up to the surface and down to the 500. The Consolidated Mercur has issued its annual report for the fiscal year ended June 30. It shows a total production for the year of $613,148.92, net profits of $16,537.08 and cash balance of $91,566.89. The mill treated an average of 638 tons per day, mining costs were $1.48, and milling costs $1.15, total expenses being 1c. per ton more than the previous year in which 50,000 more tons of ore were treated. The principal reason for the small profits is the decrease in the value of the ore. The showing is a good one considering the many difficulties that have been met.

The Escalante mine, fourteen miles southwest of Modena, is closed for the second time on account of water in the shaft. The original shaft was abandoned after a 300-gal. pump had failed to lower the water more than one inch in 24 hours and on the advice of an engineer the new shaft was started. This has struck water on the same level as the old and the mine is closed, at least temporarily. After the expenditure of $300,000 in development the Log Cabin, in Marysvale, has made its first find. A 30-ft. vein has been cut which assays $8 to $10 the entire width. The discovery was made at a vertical depth of 1000 ft. so that good stoping ground is assured. The mine manager and superintendents of the properties in the Tintic district recently visited the new power plant of the Centennial-Eureka on the invitation of Robert A. Brown, the superintendent.

General Mining News

ARIZONA

COCHISE COUNTY

[illegible] Santa Fe Copper & Gold Co. [illegible] the Copper & Gold Co. [illegible] The Superior & Boston Co. [illegible] The Copper Queen [illegible] with $4,000,000 [illegible] The Copper & Gold Co. [illegible] The Copper & Gold Co. [illegible] The Copper & Gold Co.

also purchased the Brown Monster property in the same district. The Reward mine is equipped with an air-compressor and drills; also a 20-stamp concentrating mill to which a cyanide plant is to be added. In the mine are 20,000 tons of ore estimated to assay $15 per ton. The property is to be operated by the purchasers and work will begin with a force of 40 to 60 men as soon as arrangements are made for electric power. The former owners were Philadelphia men.

Bishop, October 15.

MARIPOSA COUNTY

The Bullion Mining Co. has opened a shoot 150 ft. long on the American Eagle group near Exchequer which assays $32 per ton. B. R. Binns is superintendent.

NEVADA COUNTY

A 13-ft. vein is being opened on the Florida property on the south fork of the Yuba river that contains a high percentage of concentrate with a fair amount of free gold.——A. S. Wall, of North Bloomfield, has opened a good prospect of pay-gravel on his claims in that district. The raise from the adit driven in the bedrock has broken through into the gravel which pans well.

SHASTA COUNTY

(Special Correspondence).—The Balaklala company is running one furnace on ore from the Balaklala and Bully Hill mines, and the Cottrell fume-controller is giving excellent satisfaction, and work is to be resumed at the Balaklala mines.——The Mammoth Copper Co. is meeting with good results in the development of the Summit mine, important reserves having been recently developed, while the diamond-drill is exploring new ground.——Thomas W. Lawson, president of the Trinity Copper Co., recently informed stockholders that work would be resumed when copper advanced to 15c. According to the last report it requires $8500 per year to conduct the affairs of the company, although the property has been idle for two years.——The mill at the Victor mine is rapidly nearing completion and will be in operation within 30 days. Good ore is being extracted. The mine adjoins the Midas at Harrison Gulch, one of the best producers of high-grade ore in the county. The manager of the Midas mine last week discharged 20 miners on the charge of high-grading. Two of the men were detected in the act by the underground foreman. The superintendent estimates that $5000 has been stolen from the 600-ft. level in the past month.

Redding, October 15.

SIERRA COUNTY

The Lucky Strike group of claims three miles northeast of Forest is to be developed by a company which has been organized by A. Max. The holdings cover a strip 4500 ft. long and 600 ft. wide and include two parallel veins from the outcrops of which good assays have been obtained.——The breaking into the old workings of the North Fork property in re-opening the old incline to tap the Uncle Sam vein has stopped the work for the present on account of the foul air and gas in the old drifts. A blower is to be installed and operations resumed in a few days.——Eugene Brown and L. C. Hendry are sinking a shaft through the lava cap on Lucky Dog ridge to tap the north extension of the Eureka vein.——The Lucky Dog gravel mine which was bonded to F. W. Roher, lessee of the Omega, will be worked next spring in conjunction with the Omega.——A small hydro-electric plant has been installed at the mine of the Blue Channel Mining Co. for lighting purposes. The water was turned on and everything found to work satisfactorily.——The contractors at the Monte Cristo gravel mine are making excellent progress and have only about 40 ft. left to complete the work. Some of the old workings which were filled with water were tapped with a bore-hole and operations were stopped for a short time till that part of the mine was drained.

TUOLUMNE COUNTY

(Special Correspondence).—The Black Oak mine has been unwatered and sinking was commenced on October 17, with a crew of 12 men. The shaft is 1600 ft. deep and, it is understood, will be sunk to the 1800-ft. point.——The work of erecting a building for the 10-stamp mill to be installed at the Duffield mine, near Arastraville, has been completed. An electric motor to operate the air-compressor has been put in place.——A small mill is to be put up on the Old Dominion mine, the property of A. Baier and George Grant, situated near Columbia.——The old Mexican mine, near Jamestown, worked with great success in the early days by Mexicans, has been reopened by Miller & Roscoe.——Sinking has been temporarily discontinued in the Hancock shaft at Karnac and cross-cutting commenced at the 100-ft. level to tap the vein, which at a depth of about 50 ft. changed from vertical to 45° pitch. A mill is to be installed, the machinery for which is on the property.

Tuolumne, October 18.

COLORADO

CHAFFEE COUNTY

A new lease by local parties has been taken on the Belle of Granite mine, and work is again starting on this old property which will lead it back to the active list. The mine has been idle for several months, due to difficulties between owners and lessees. The property has produced a great deal of high-grade ore, in the mining of which all low-grade material was thrown on the dump in the belief that it was unprofitable. The new lessees, after thoroughly prospecting and sampling the dump, find that it contains ores assaying $10 to $40 per ton, all of which can be profitably milled. The mine is equipped with a 20-stamp mill and pipe-line. The dump will be run through the mill, as well as a large tonnage of ores of low value which are blocked out in the mine.

LAKE COUNTY

The end of the third quarter of the year finds the Leadville district in better shape than it has been since the slump of 1907. This condition is due to several incidents that have happened since the beginning of summer, among them being the opening of the great fissure vein of the Cleveland in the granite. This alone has been the means of a number of properties in the neighborhood resuming work and the starting of several new shafts; the connecting of No. 2 shaft of the Resurrection with the Yak tunnel, the sinking of the shaft beneath the tunnel-level, and the hoisting of ore and waste to the surface instead of hauling it out to the portal, a distance of nearly four miles. The finding of carbonate of zinc continues to interest many miners and much prospecting is being done for this new class of ore in other parts of the district outside of Fryer and Carbonate hills. It has been found in some claims on Iron, Breece, and Rock hills, and it is more than likely that it will be found in all parts of the district. Whether it will appear in such immense bodies as is in the Maid of Erin, Henriette, Adams, Wolftone, Waterloo, Morning Star, Evening Star, and Big Chief, and also hold up to the grade of 45 to 50%, development alone will decide. Another good discovery of carbonate of zinc is reported from the Stevens shaft, on Rock hill, ore being opened in three different parts of the property that assays 45 to 50% zinc. Shipments are being made from this find.——The Sugar Loaf adit has been completed to the 2700-ft. station, and it is still going forward at the rate of 100 to 125 ft. per month. The objective point of this adit is the Dinero vein, which soon will be reached, and is expected to yield large bodies of ore. Numerous veins and stringers have been cut in the course of development, the most promising of which will be prospected when the Dinero has been reached.——The Colonel Sellers promises to be a heavy shipper at no distant date, as driving soon will begin from the 400-ft. level to the upper orebodies, which are known to be large and of good value. Steel ore-bins are being erected and other improvements made. The company expects to ship in the neighborhood of 350 tons daily.

PARK COUNTY

The new pyritic smelting plant recently put in operation at Fairplay is successfully operating, and is treating a good

tonnage of ore coming principally from the mines along the north and south forks of Mosquito creek. The Moose and Dolly Varden mines on Mount Bross are also shipping to this smelter. The Mosquito district now has four producing properties which furnish practically two-thirds of the mineral output of the county. The building of the smelter has had a stimulating effect upon many properties here, most of which are low grade and in a condition of non-production because of a lack of reduction works, the ores being of too low a value to withstand shipment to distant smelters. Several former producers are now expected to become active again, and the outlook for a larger mineral product this year than in any former season is good.

TELLER COUNTY

A rich seam between three and four inches wide has been opened in a 4-ft. vein on the 1000-ft. level of the Trilby property in the Cripple Creek district. The streak contains both free gold and sylvanite and assays over 30 oz. gold per ton. There are seven shoots now opened in the Trilby workings and shipments are being forwarded regularly. —Fogleman & Lee, operating on blocks 14 and 15 of the El Paso ground, have opened a shoot on the third level north of the shaft that assays $30 to $35 per ton. — Carl Johnson, lessee of the Maggie claim between Raven and Bull hills, recently shipped two carloads of ore that assayed about $35 per ton. — Lessees operating in the American Eagles shipped 12 cars of ore during September which assayed $34 to $194 per ton and averaged $55, the total amounting to approximately $16,000. — The output from the Cresson property during September was 2500 tons of $25 ore. — In the suit over apex rights brought by the Work Mining & Milling Co. against the Doctor Jack Pot, the decision has been rendered in favor of the latter.——F. L. Smale and associates have secured an 18-months lease on the east half of the Last Dollar property.——G. E. Copeland, of Victor, has opened a 30-ft. vein on the 350-ft. level of the Montrose mine and is shipping 30 tons of hand-sorted ore per day which averages $25 per ton. —The compressor plant at the Ophelia was burned October 10 and pipe-lines are being laid from the Callie and Little Clara mines.

IDAHO

IDAHO COUNTY

The machinery for Grangeville mine which was recently taken over by Portland operators has arrived in Elk City, and is being forwarded to the mine. The equipment consists of a Joshua Hendy hoist, 500-ft. capacity, Knowles sinking pump, Ingersoll-Rand compressor and drills, and five 1500-lb. stamps. It is expected to have the plant in operation within the next month. Underground the shoot has been proved to be about 300 ft. long and 8 ft. wide. S. J. Fore is manager.— Adit No. 2 on the American Eagle ground about 200 ft. from the present stopes has opened the shoot which assays $17 per ton at that point.——The cross-cut on the Gold Bug group in the Tenmile district has opened a shoot of free-milling ore.

MISSOURI

JASPER COUNTY

(Special Correspondence).—In various parts of the district systematic prospecting is being carried on. In the extreme northern part near Neck City a number of drill-holes have been sunk on the Weaver farm and a good discovery of zincblende reported. Five out of seven holes are in pay-ore, the mineral ranging from 158 to 175 ft. in depth.——Activities have been revived in the old South Carthage mines which were rich silicate producers about ten years ago. The burning of the Central pumping plant stopped operations there, the ground being flooded and left untouched since that time. Mallory & Co. have recently prospected on the old Kiheka lease and found lead three feet below the surface. At 16 ft. silicate was struck and continued to 25 ft. The silicate ore here is particularly high grade and efforts are to be made at once to open these rich old producers as it is known that the ground is still rich in ore.——Another old camp which is active after an idle period is the Lehigh Road. The United Zinc Co. has bought large leases just north of the camp and has done considerable prospecting. The results of the efforts have been carefully kept secret but it is known that some excellent discoveries have been made and the ground will be further opened. The company has made a number of sub-leases and several derricks are going up. Hand jigs are used for the present. — Another discovery of importance was made recently by a Joplin company on an abandoned lease of the Granby company on Shelter hill. A number of companies worked this land and four shafts are down but the success was indifferent. — The Oronogo Circle Co. has just made a rich find of 'Steel Jack' in the roof of a drift at 239 ft. ——Many companies are hastening the completion of their milling plants during favorable weather. Among the companies building is the Empire Zinc Co. which is erecting a large 350-ton mill in the disseminated zinc belt west of Joplin. The ore is an extension of the deposits of the Sampson and Muskingum mines. The tract worked by the Empire company is the old Miles land and previous to the erection of the mill systematic drilling was carried on around an old shaft. — Another new plant will be added to the west Joplin camp by the erection of the 400-ton mill by the Falls company on the former Black Cat lease. Following the removal of the former mill the present company began a thorough prospecting with the sinking of three shafts and driving two connecting drifts. — In the Webb City camp several new plants are being built. On the Centre Creek land the Prudential company is building a 200-ton mill on a sub-lease from E. Tyree. Three shafts have been put down disclosing ore in sheet formation at 190 feet.

Joplin, October 15.

NEVADA

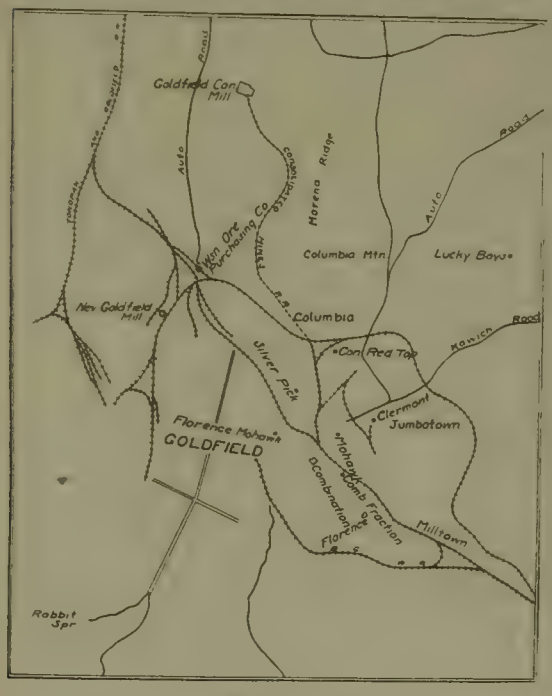
CHURCHILL COUNTY

The Nevada United Mining Co., operating at Copper Reid camp, High Cloud district, thirty-five miles southeast from Lovelock, has driven a 3050-ft. cross-cut, gaining a depth of 1000 ft. from the highest surface point. A lode of zinc-bearing ore was intersected at 1300 ft. from the portal, this ore assaying about 8% zincblende. The last 250 ft. of the cross-cut passed through lode material; 25 ft. of this is ore assaying 2½% copper; then 35 ft. of leached gangue; beyond this is 90 ft. of massive pyrite ore. John T. Reid, manager for the company, under whose direction all the work has been done, counts on being able to supply a big tonnage of iron ore required as a flux, as well as a good tonnage of copper and zinc ore. However, the company is not yet ready to ship ore. About 700,000 gallons of water per day is flowing from the cross-cut. The company has spent about $220,000 on development and equipment.

ESMERALDA COUNTY

(Special Correspondence).—The Goldfield Consolidated Mines Co. shipped to the smelters in September 123 tons of ore valued at $748.45 per ton, or a total of $92,060. This ore was taken chiefly from the new workings on the 1000-ft. level of the Clermont mine, where the average value of the product from new drifts was 2.26 oz. gold per ton. The drift has followed the vein for over 100 ft., but after being in ore of excellent grade for 35 ft. the quality showed a material depreciation although the management is still encouraged with the showing and it is believed that with the present developments alone the discovery is a most important one. In character this ore more nearly resembles that of the main Mohawk ore-shoots than it does the ore of the vein first opened on the 1000-ft. level of the Clermont, farther to the north and east, and contains seams of the typical Mohawk ore, with the characteristic breccia, talc, and splashes of telluride. The best grade of ore continues to come from the Clermont, that most nearly approaching the new orebody on the 1000-ft. level having been taken from the 600-ft. level. ——The Florence Goldfield company is treating 150 tons per day, shipping concentrate. It is said that a satisfactory profit has been realized from a comparatively low-grade product but that the mill heads have advanced of late owing to the im-

proved quality of the ore coming from the stopes opened in the northern vein on the 350-ft. level and followed for a considerable distance to the south from the territory of the old Reilly lease. Laterals will be driven on the 600 ft. level to explore territory that has been highly productive above the 500, particularly on the main Florence, the Engineers, and the Little-Florence veins. One of the strongest ore-shoots of the Florence was developed by a winze 60 ft. below the 500 ft. level on the Rogers lease, adjoining the Little Florence and at the southern extremity of the Florence hill, but the heavy flow of water prevented extensive work at this point to which a drift will be driven as soon as practicable on the 600-ft. level. —At its leased mill the Combination Fraction company is treating 50 tons per day with a satisfactory recovery of gold. The annual report of this company is awaited with interest, but it is not thought probable that a dividend will be declared at this time as the company has been under heavy



Goldfield District.

expense for development and mill repairs and although the treasury is known to be in a prosperous condition the relatively small amount of ore treated in late months, owing to water shortage, must of necessity have curtailed the company's earnings to a considerable degree.——By a recent decision of the District Court in the case involving the Diamondfield Black Butte Reorganized Mining Co. it was determined that the treasury stock held by the Registration Trust Co., as trustees for the mining company, had been illegally voted at the stockholders' meeting and that the Patrick faction had been duly elected directors of the company. The Manning contingent has not announced whether or not it will take an appeal to the Supreme Court, but L. L. Patrick and his associates will proceed to endeavor to raise funds for the development of the claims which have already yielded about a quarter of a million in shipping ore and have a large tonnage of excellent milling ore exposed on dumps and in the workings. Lessees are still making occasional shipments of rich ore from near the surface.——Development on the Yellow Tiger continues on the 700-ft. level and water difficulties have been eliminated at this depth. —Two shipments of $50 ore have been made from the Nevada Eagle, three miles west of town, and there is a good showing of ore in the raise above the 250-ft. level.——The Grizzly Bear Mining Co., operating a lease on Consolidated ground, has been idle with the exception of keeping water out of the 1200 ft. shaft, the deepest in the district. It is possible that operations may be abandoned as the Consolidated has refused to extend the lease, which expires February 1, 1911. Only low-grade ore has been found in driving at a depth of 1170 ft. The project was backed by Parisian bankers.

Goldfield, October 15.

HUMBOLDT COUNTY

The Crawford Leasing Co., in which C. P. Crawford and others of Salt Lake City are interested, has taken a 2-years lease on the Mayflower group of claims in National camp, and will proceed with development. Mr. Crawford spent two weeks in the district this month.

NYE COUNTY

(Special Correspondence).—John B. Barker, J. P. Burns, and P. Chandler have secured a two-years lease on the Capricorn property on the east slope of the Funeral range about sixteen miles from Rhyolite. This property has yielded in the past several shipments of rich silver ore, mainly in the form of chloride.——The Keane Wonder management has purchased a Sullivan compressor and several machine-drills, and is installing a 75-hp. engine to operate them. An addition of 20 stamps and cyanide plant is to be built at the mill and it is probable that the line of the Nevada-California Power Co. will be extended to the mine, the steam plant being retained as a reserve.——The lessees on the Diamond Bullfrog on the east slope of Ladd mountain are getting better results than any of the lessees who have operated in the Rhyolite district for some time. They have shipped several carloads of ore that have yielded over $50 per ton. The property is opened by a 400-ft. shaft and over 600 ft. of driving has been done. The last carload of ore was shipped to the Eclipse mill which is being fitted with an automatic sampler for custom work.

Rhyolite, October 15.

(Special Correspondence).—The Sand Grass shaft of the Tonopah Mining Co. has been sunk to a depth of 525 ft. and is still in the later andesite. In the last week in September the desert mill of the Tonopah Mining Co. dropped continuously 99 of the 100 stamps, crushing 3550 tons of $20 ore.——Work at the new surface plant of the Tonopah Belmont at the Belmont shaft is proceeding slowly, due to the tardy arrival of machinery and structural iron. The east drift on the 1100-ft. level has passed through the faulted zone and is again in the earlier andesite. The work of sinking the shaft from the 1100-ft. level to the 1200-ft. has been resumed.——The Tonopah Extension is making rapid progress on the south foot-wall cross-cuts from the main west drifts of the 500 and 600-ft. levels. These cross-cuts are to prospect the 3-ft. vein of high-grade milling ore that a similar cross-cut on the 400-ft. level opened recently.——The MacNamara reports a new discovery of high-grade shipping ore on the 300-ft. level. From one to two feet of this vein is being sacked underground.——In the West End two new raises to the west on the 400-ft. level have cut the main vein and stoping will begin shortly. ——The new discovery fifteen miles east of Tonopah has been bonded to George Wingfield for $2000 in cash and $100,000 within six months. The value of the property now is merely guess work as the deepest work is a 15-ft. hole.

Tonopah, October 14.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence).—The main shaft of the Deadwood mine in the Mogollon district was sunk 12 ft. during the week and has reached a depth of 480 ft. The framework for the mill is nearing completion and the machinery for the plant is being delivered, some of the heavier parts having arrived within the past few days.——The concrete dam at the intake of the pipe-line being laid by the Ernestine Mining Co. has been finished and all the trenching with the exception of some rock work has been completed. The 4-in. pipe for the line has been delivered and a large crew of men is busy on the line.——The production at the Socorro mine is approaching 150 tons per day and

UTAH

BEAVER COUNTY

[illegible] The Lucky Monday company, a [illegible] the mouth of Beaver creek, [illegible] to be used for the [illegible] of the Monday property, [illegible] on the Hoyt and Lucky Boy groups. [illegible] development [illegible] [illegible] [illegible]

Universities and Mining Schools

H. D. Pallister, M.E., of the Case School of Applied Science, formerly mining engineer with the Chisos Mining Co., Terlingua, Texas, and later instructor in mathematics at the Chase School, has been appointed instructor in metallurgy at the School of Mines, Pennsylvania State College, and Victor Ziegler, B.A., of Iowa University and M.A. of Columbia, instructor in geology and mineralogy.

A number of changes in the faculty of the College of Engineering at the University of Wisconsin have marked the opening of the college year. One of the important additions to the faculty is F. W. Doolittle, who succeeds C. H. Burnside as Assistant Professor of Mechanics. Mr Doolittle holds the degree of Bachelor of Arts from Princeton and Civil Engineer from the University of Colorado. Mr. Burnside has resigned to accept a position at Columbia. J. C. Steen, for a number of years superintendent of the machine shops, has resigned and will be succeeded by A. L. Goddard, M.E., '96, Wisconsin.

J. A. Holmes, head of the United States Bureau of Mines, addressed the students of the College of Mines of the University of California, and on the evening of October 19 he spoke to the association which is studying the problem of disposition of sulphur dioxide formed in copper smelting. Mr Holmes spoke of the problems to be studied and emphasized the fact that the Bureau would endeavor only to undertake work which is beyond the scope of a single company, both in the conservation of life and natural resources, and in improvement of metallurgical processes. He stated that a number of cars were to be sent to the various coal-mining districts equipped with men and apparatus to demonstrate mine-rescue methods and first aid to the injured. The work of testing various explosives and experimenting with coal dust will be continued at the Bureau's headquarters in Pittsburg.

The Ohio State University at Columbus has issued Bulletin No 32, Volume XIV, a commemorative bulletin, descriptive of the Department of Civil Engineering. It was intended to publish this brochure nearly two years ago upon the thirty fifth anniversary of the founding of the department, but a number of causes prevented the work being completed at that time. It reviews the history of the University and gives short sketches of the past and present instructors. Especial emphasis is laid on the practical summer school work and a number of half tones show representative views of the students during this portion of the year with the equipment used. A list of the alumni, ex-students, and present attendants is given and the outline of plans for the enlargement of the department to meet the growing needs of the institution. A map of the Yellowstone National Park and part of the abutting Forest Reserve is also given.

Fletcher A. Gould, instructor in civil engineering at the Oregon Agricultural College, spent the summer as assistant city engineer of Owosso, Michigan. The rapid growth of the engineering school of the O. A. C., which opened its new year September 23, has made it necessary to add five new men to the faculty this year. This addition to the staff, with the excellent equipment for instruction in electrical, mechanical, civil, and mining engineering, gives the school high rank among the institutions of technical training in the Northwest. The department of mechanical engineering has added H. S. Marks, Cornell, '07, to its staff of instructors. Since receiving his degree, Mr. Marks has had practical experience both with the Chicago Telephone Co., and in the shops of the Delaware & Hudson Railway. He is at present State inspector of weights and measures for New York at Troy. Three men are added to the faculty of the department of electrical engineering this year. An instructorship is to be filled by J. F. Meister, Cornell, while Fred E. Ewart, of Portland, and F. Eugene Pernet, of Corvallis, both O. A. C. graduates last June, are named as assistants.

Decisions Relating to Mining

Specially reported for the Mining and Scientific Press.

LEASE OF MINE

The lessee of a coal mine bound himself by the lease to operate the mine in the usual or practical way of mining, to build a tip house and make such other improvements as would be necessary in the operation of the mine to pay the lessor a royalty of 10c. per ton on all the coal mined. The lessor, a corporation owning a general store, agreed to sell the lessee and his employees all goods and supplies at the same price charged its own miners. It also agreed to furnish the lessee a sufficient number of cars to handle the output of the mines. The lessee entered upon the operation of the mine and before the expiration of the first year had become indebted to the lessor in a large sum in excess of what the mine yielded. Thereupon the parties entered into a new contract, whereby the lessee was to pay the lessor out of the sale of the coal from the mine $100 per month until such excessive indebtedness had been paid in full. It was also provided that if any one of said payments should become due and unpaid the lessee would surrender to the lessor certain property used in operating the mine, unless such default was occasioned by a strike. The contract also provided that in the event of failure of the lessee to make such payments, he thereby sold, granted, bargained, and conveyed all his property to the lessor for the sum and amount of such indebtedness, and in such event the original lease was to be null and void. Some time after the execution of this new contract default was made in the payment of the monthly installments and the lessor took possession of the mine and of the lessee's property and refused to permit him to operate the mine. Thereupon the lessee brought an action for a cancellation or reformation of the last contract on the ground of fraud and for damages for depriving him of the possession of the mine. The lessor admitted that such contract was obtained by fraud and that the lessee himself was a party thereto and not in position to demand equitable relief. The evidence showed that the second agreement was prepared by the president of the corporation, the lessor; that the lessee was uneducated and unable to understand the contract; that the president told him at the time that it must be executed to show the settlement of the amount due; that the lessor had a lien on the lessee's property to secure its payment and that it in no way affected the original contract or lease. It appeared also that the president wanted to and did use the second contract for the purpose of inducing third persons to purchase his stock in the corporation because of the unprofitableness of the mine and the mining business, and that he did thereafter show the contract to such third persons and sold his stock to them. It was accordingly decided that the lessee was not a party to the fraud, that he was entitled to a reformation of the contract and to a return of his property and the possession of the mine, and that the lessor was only entitled to a lien on such property for the amount due, enforcible only after the expiration of the lease. But the lessee was entitled to no more than nominal damages because it appeared that the mines had been operated at an actual loss.

Phenix-Jellico Coal Co. v. Grant, (Ky.) 125 Southwest. 165, Feb. '10.

COMPETENCY OF MINE BOSS AS AN EXPERT WITNESS

Where a mine boss testified as expert witness on behalf of owner and operator, and had, in answer to questions, qualified himself to speak as expert in an action for injuries from falling rock in the mine, it was competent to show that such boss had been three times tried and convicted for neglect of duty as mine boss, to develop facts tending to rebut the conclusion of expert competency.

Princeton Coal Mining Co. v. Howell, (Ind.) 92 Northeast. 122, June '10.

Personal

Demorest B. Lay, of Reno, is in San Francisco.

Charles T. Rice has been in San Francisco.

W. C. Mendenhall has been in San Francisco.

Edgar Rickard has sailed from New York for London.

Howard D. Smith was in St. Louis on his way to New York.

John A. Renner, mining engineer, is in Lovelock, Nevada.

J. A. Holmes and H. Foster Bain visited Coram, California, Tuesday last.

S. E. Bretherton is in Plumas county, California, on professional business.

Charles B. E. Douglas has left San Francisco for Bolaños, Jalisco, Mexico.

J. P. Keeny has returned to Woodland, California, from a trip to British Columbia.

Gelasio Caetani left on the *San Juan* October 15 for Nicaragua for a three months' trip.

E. F. Burchard is on his return trip to Washington, D. C., from an extended tour through the West.

George W. Paymal, of San Francisco, is spending some time in the vicinity of Winnemucca, Nevada.

J. B. Fleming is at Fairview, Nevada, to design and direct the construction of the Nevada Hills mine.

Wilbur H. Grant is working on the geological survey of the Santa Eulalia properties in Chihuahua, Mexico.

D'Arcy Weatherbe will spend the winter at the Kolchan mines in East Siberia preparing for dredging next season.

E. V. Daveler, superintendent of the Phoenix mine at Sierra City, has been in San Francisco on professional business.

Henry Hay has accepted a position with the Engineering Department of the Consolidated Gold Fields of South Africa, Ltd., at London, E. C.

John Cooper has resigned as mine superintendent of the Mexico Mines of El Oro in order to further his railroad interests in the State of Zacatecas.

E. Harms, superintendent of the Torreon smelter, Torreon, Mexico, is on a trip for a month through Colorado, Utah, and Montana, visiting smelters and mines.

Carl Scholz is in Europe to purchase apparatus for equipping the Illinois Mine Rescue Stations and to make investigations for the United States Bureau of Mines.

Sumner S. Smith has accepted a position as mining engineer with the United States Bureau of Mines and will leave San Francisco for Pittsburg, Pennsylvania, October 24.

Arthur Lakes and Arthur Lakes, Jr., have removed their offices to 701 Gas & Electric building, Denver, where they will continue their practice as mining and metallurgical engineers.

Eli T. Conner has opened a temporary office at 516 Traler's National Bank building, Scranton, Pennsylvania, in order to properly care for important professional engagements in the Lackawanna and Wyoming regions of Pennsylvania. His office in the Real Estate Trust building, in Philadelphia, will be open as usual.

C. H. Shamel, of Seattle, Washington, sailed on October 11 from San Francisco for the Philippine Islands. He will spend four months investigating the mining, geological, and agricultural features of these islands. Afterward, he will spend some time in China and make brief stops at the Malay Peninsula, Ceylon, and Hindustan, returning by way of Europe. He will return to Seattle in the fall of 1911, and resume his practice of law and his work in the law department of the University of Washington. While in the Philippines his address will be care of Elk's Club, Manila, Philippine Islands.

Market Reports

LOCAL METAL [illegible]

San Francisco, October [illegible]

Antimony	12 [illegible]	Quicksilver, flask	[illegible]
Electrolytic Copper	[illegible]	Spelter	[illegible]
Pig Lead	4.50 [illegible]	Tin	[illegible]

METAL PRICES

Exchange from New York

Values in cents per pound

Date.	Electrolytic Copper	Lead	Spelter	Silver, per oz.
Oct. 14	12.50	4.40	5.50	57
" 14	12.55	4.40	5.50	[illegible]
" 15	12.50	4.40	5.50	[illegible]
" 16	Sunday	No market.		
" 17	12.50	4.40	5.65	56
" 18	12.55	4.40	5.55	55
" 19	12.50	4.40	5.50	56

ANGLO AMERICAN SHARES

Cabled from London

	Oct. 13 £ s d	Oct. 20 £ s d
Camp Bird	1 11 0	1 12 0
El Oro	1 7 9	1 7 0
Esperanza	2 8 9	2 8 0
Dolores	1 5 0	1 5 0
Oroville Dredging	0 7 0	0 7 0
Mexico Mines	7 15 0	7 15 0
Tomboy	0 17 6	0 18 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES, BOSTON

	Closing prices Oct. 20.		Closing prices Oct. 20.
Adventure	$ 8½	Mohawk	$ 47½
Allouez	44⅝	North Butte	73
Atlantic	8	Old Dominion	41
Calumet & Arizona	70½	Osceola	131
Calumet & Hecla	550	Parrot	14
Centennial	21½	Santa Fe	1⅛
Copper Range	71	Shannon	12
Daly West	1⅜	Superior & Pittsburg	12⅝
Franklin	11½	Tamarack	60
Granby	70	Trinity	6⅞
Greene-Cananea, ctf	74⅜	Utah Con	24¾
Isle Royale	22¼	Victoria	3
La Salle	10⅜	Winona	10
Mass Copper	9⅞	Wolverine	130

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS, NEW YORK

(By wire from Catlin & Powell Co., New York.)

	Closing prices: Oct. 20.		Closing prices: Oct. 20.
Amalgamated Copper	$ 70¾	Miami Copper	$ 19⅝
A. S. & R. Co.	76⅛	Mines Co. of America	½
Braden Copper	4	Montgomery-Shoshone	⅛
B. C. Copper Co.	7¼	Nevada Con	21½
Butte Coalition	19⅝	Nevada Utah	1⅝
Chino	21⅛	Nipissing	10¾
Davis Daly	2⅛	Ohio Copper	1¼
Dolores	5½	Ray Central	1⅝
El Rayo	3⅛	Ray Con	20¼
Ely Central	⅛	South Utah	1¾
First National	3⅛	Superior & Pittsburg	12⅞
Giroux	7⅛	Tenn. Copper	39⅞
Guanajuato Con	⅛	Trinity	6¾
Inspiration	9⅝	Tuolumne Copper	3⅝
Kerr Lake	6⅛	United Copper	4⅝
La Rose	4½	Utah Copper	51⅛
Mason Valley	10⅛	Yukon Gold	3⅞

SOUTHERN NEVADA STOCKS.

San Francisco, October 20.

Atlanta	$ 12	Mayflower	$ 3
Belmont	4.00	Midway	21
Booth	9	Montana Tonopah	95
Columbia Mtn	4	Nevada Hills	2.50
Combination Fraction	32	Pittsburg Silver Peak	51
Fairview Eagle	35	Rawhide Coalition	6
Florence	2.10	Rawhide Queen	——
Goldfield Con	8.00	Round Mountain	11
Gold Kewenas	6	Silver Pick	6
Great Bend	3	St. Ives	15
Jim Butler	29	Tonopah Extension	1.65
Jumbo Extension	31	Tonopah of Nevada	8.75
MacNamara	29	West End	56

(By courtesy of San Francisco Stock Exchange.)

HANDLING GRAVEL ON THE PUGET SOUND

The demand for gravel for use on the highways, as well as for concrete is daily increasing everywhere. Along the Pacific Coast the gravel is obtained from large pits on the shore of Puget Sound, about 30 miles by water from Seattle. The barges are loaded, towed by tugs and delivered alongside a pier at Seattle. A simple, although unique system, has been intalled by the Richmond Beach Sand & Gravel Co., of that city, for unloading the gravel from the barges to elevated storage bunkers, from which wagons are loaded by gravity, as well as railroad cars for transporting gravel to other points. The elevated bunkers are constructed on pile footings at the head of a narrow slip on the water front.

Fig. 1. Gravel Bunkers at Seattle.

The first illustration shows a recent view of these bunkers. Along both sides of this narrow neck of land are large warehouses on wharves extending out to the harbor line. Between each wharf and the slip is a pile trestle car

Fig. 2. Drop-Pan Conveyor.

rying a railroad track, and these tracks connect at the shore end of the slip with the main line of the Great Northern and Northern Pacific railroads. The gravel barges are unloaded with the use of a clam-shell bucket swung from a stiff-leg derrick mounted on a trestle over one of the railroad tracks, the gravel discharging into a Jeffrey receiving hopper elevated at the end of the bunkers, or directly to cars on either track. Nearly all of the gravel, however, is delivered to the storage bunkers for local distribution in wagons. The derrick is operated by a double-drum hoist geared to a single-phase, alternating-current, variable speed, 60-hp. motor. The bunkers are 20 by 120 ft. and provide a storage capacity of over 1000 cu. yd. They are divided into 24 bins thus enabling the various sizes of gravel to be handled independently. The gravel passes from the receiving hopper through a distributing plate feeder, which is also constructed to deliver sand to a Jeffrey steel drop-pan conveyor, which extends over the entire length of the bin on the longitudinal centre line of the latter. A roof is provided which covers the bins and conveyor line. The conveyor line is 130 ft. between centres, traveling at 70 ft. per minute, geared to a single-phase, alternating-current, continuous-speed motor. Each pan section of the conveyor is 18 in. wide, 24 in. long, and 6 in. high carried on two axles supported by two pairs of flanged wheels placed at the ends of every pan and traveling on a pair of rails on a frame spanning the bins. (See Fig. 2.) Only one of the axles extends to the chain, allowing the pan to pivot freely, between the two strands of chain. The rails are in sections hinged over each bin so that any section may be swung out of the way. This conveyor is so designed that when each pan reaches a delivery point where a section of trackage has been taken out, the rear end of the pan automatically drops down and the load is discharged into the bin below. As the conveyor proceeds, the pan returns; the separate pieces of track swing back, in no way interfering with the movement of the conveyor. The floors of the bins are sloped to a row of outlet chutes along both sides. A roadway is built around the bunkers at the level of the street in front of the slip that wagons approaching and leaving may not interfere. The chutes are set to deliver into the wagons and are each controlled by a gate operated from the latter. Barges loaded with gravel are delivered to the plant as frequently as the market demands. The gravel is unloaded from them at the rate of 100 tons per hour and the supply drawn from the bunkers as required. Under normal conditions, the derrick will deliver from the barges to the elevated hopper at a rate of 60 cu. yd. per hour. The Jeffrey conveying system was designed to handle the gravel as rapidly as it flows from the hopper, its rated capacity being 80 cu. yd. per hour.

CATALOGUES RECEIVED

Vulcan Iron Works, Wilkesbarre, Pennsylvania. 'Direct Acting Hoisting Engines.' Illustrated. 116 pages. 6 by 9 inches.

Alberger Pump Co., 140 Cedar street, New York. Catalogue C. 'Centrifugal Pumps.' Illustrated. 48 pages. 6 by 9 inches.

The Hydraulic Cyanide Agitation Co., Warren, Pennsylvania. 'Hydraulic Agitation for Cyanide Plants.' Illustrated. 16 pages. 6 by 9 inches.

Broderick & Bascom Rope Co., St. Louis. 'The B. & B. Automatic Loader System of Aerial Wire Rope Tramways.' Illustrated. 16 pages. 7 by 10 inches.

U. S. Flexible Metallic Tubing Co., San Francisco, Los Angeles, Houston, St. Louis, and Seattle. 'Interlocking Metal Hose.' Illustrated. 22 pages. $3\frac{1}{2}$ by 6 inches.

Sullivan Machinery Co., Chicago. Bulletin No. 58 D. (Second Edition.) 'Tandem Corliss Air Compressor, Class W C.' Illustrated. 20 pages. 6 by 9 inches. Bulletin No. 58 F. 'Small Air Compressors.' Illustrated. 20 pages. 6 by 9 inches. Bulletin No. 58 G. 'Duplex Air Compressors.' Illustrated. 16 pages. 6 by 9 inches.

Alberger Condenser Co., 140 Cedar street, New York. Catalogue No. 8. 'High Vacuum Apparatus.' Illustrated 32 pages. 6 by 9 inches. Catalogue No. 11. 'Wainwright Expansion Joints.' Illustrated. 12 pages. 6 by 9 inches. Catalogue No. 12. 'Cooling Towers.' Illustrated. 12 pages. 6 by 9 inches. Catalogue No. 13. 'Wainwright Water Heaters.' Illustrated. 16 pages. 6 by 9 inches.

MINING AND SCIENTIFIC PRESS.

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INDEX TO ADVERTISERS, PAGE 44. PROFESSIONAL DIRECTORY, 6-26. BUYERS' DIRECTORY, PAGE 42.

HYDRAULIC AGITATION

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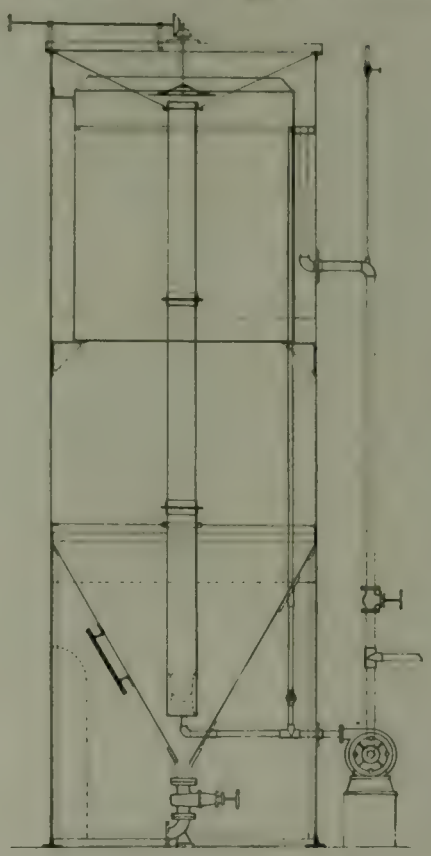

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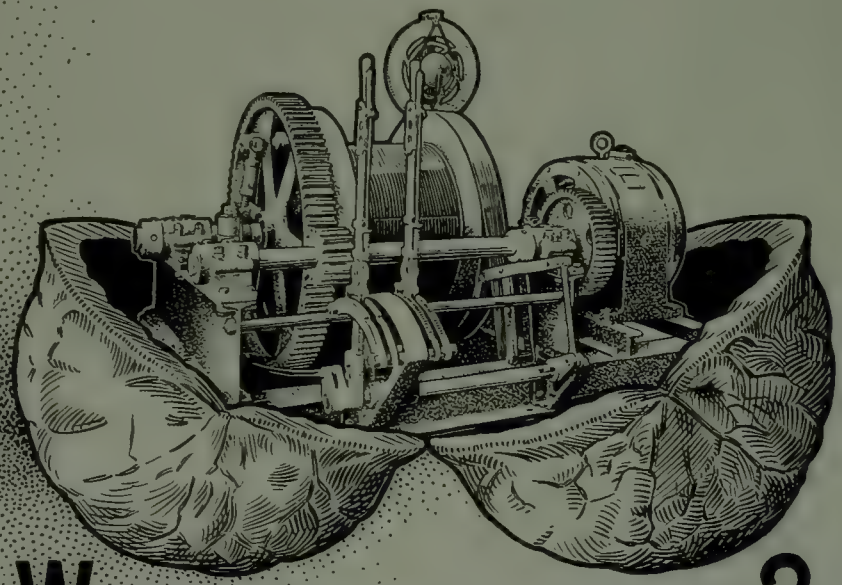

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EDITORIAL

FREIGHT congestion is already beginning to demoralize traffic. On the Baltimore & Ohio Southwestern there has been a virtual blockade. Severe shortage in the Chicago and dependent coal markets is anticipated this winter, since far less than the normal amount of coal has been moved during the summer.

ALASKA and the Morgan-Guggenheim syndicate are so much in the public eye that we take special pleasure in presenting this week pictures of the famous Bonanza copper mine and of the Copper River & North-Western railroad. Fortunately the controversy that has waged over coal matters has not involved the copper mine, and construction on a large scale has gone steadily forward. Such substantial work as is being done in the Copper River country deserves, as we hope it may achieve, success of a commensurate order.

ABANDONMENT of the Braceville, Illinois, mine is one of the penalties resulting from the long-continued strike and the methods used by the men in fighting. The engineers and firemen having been withdrawn, it is now found unprofitable to attempt to recover the mine. The Braceville was the largest mine in Grundy county, shipping 221,504 tons of coal in 1909. The Braceville Coal Company employed 430 men and was an old and successful corporation. The mine itself probably would have been closed shortly in any event, as the ground was nearly worked out, but the loss from its premature abandonment must be charged to the waste involved in our present methods of fighting and settling labor disputes.

DIRECT smelting of ore assaying 2.62 per cent only of copper, and gold and silver to a total value of less than a dollar per ton, is being regularly carried on at the works of the Balaklala Consolidated Copper Company in Shasta county, California. When account is taken of the situation of the mine, the necessity of bringing in coke from China, Germany, or some point from which charges are equally great, and the fact that the project was organized at a time when copper sold at a price much above that which has obtained since the plant was open, great credit is due Mr. R. T. White, the manager, and his associates. That so small and heavily handicapped an enterprise should expend the money necessary to develop on a large working scale the Cottrell process of fume precipitation, speaks well for the professional standards of the men in charge. Their success will leave others much in their debt.

ANNEXATION of Korea by Japan has materially changed conditions in certain particulars. The extra-territorial rights of foreigners naturally have disappeared. Old concessions and enterprises undoubtedly will remain undisturbed: indeed since the Japanese have been in Korea they have afforded established enterprises every reasonable facility in the way of additional concessions of forest, rights of way, and other things legitimately necessary to success. In Japan proper, as is well known, foreigners cannot own land and foreign companies are not given concessions to mines. Just how this rule will be applied in Chosen, as Korea is now to be called, has not been made clear. That foreign capital will be given some opportunities is probable, but until the terms are made known, promotion is at a standstill.

EXTENSIVE mine development for some particular metal is sometimes surprising if not always disappointing in its results, as, for instance, the effort of a miner in the Black Hills of South Dakota who industriously prospected his claim for wolframite which he failed to find, though he did discover gold in surprising amount, taking out over $70,000 in a few weeks. In California work has been done to develop copper ore which found little copper, but did discover a great deal of zinc sulphide, though nothing has since been done to develop it. Other similar instances might be cited which tend to show that prospectors do not always find what they expect, and that they frequently fail to take advantage of and turn to the best use the discoveries they do make.

SIBERIA and its placer mines are like to attract more and more attention. The Northeastern Siberian Company, Ltd., has been one of the most discussed enterprises in that country. Its whole career has emphasized the need of better understanding between the Russians and those, Americans and others, who would take part in development of Siberian mines. The story of the 'confiscation' of gold by one of the officials has been frequently repeated, and it is a pleasure to present this week Mr. John Rosene's statement completely exonerating the Russian officials of any blame in the matter. Better acquaintance will prevent such misunderstandings. Siberia needs the American and English engineers and financiers who are disposed to undertake mining there and we, for our part, need perhaps more patience and less suspicion of those whose ways are not as ours.

PHILIPPINE dredging fields have heretofore been worked almost entirely by small native and New Zealand dredges. This is not surprising when account is taken of the limited amount of definite knowledge of the extent and richness of the ground, the exposed position of many of the dredging sites at Paracale, and the relatively small amount of capital locally available for investment. New Zealand dredges are much smaller and less expensive as to first cost than are those of the California type. They have been erected on such terms that the machine could be paid for from the returns, in other words, the manufacturers have found the capital, and under these conditions they naturally have done the pioneer work in the Philippines. There is undoubtedly a legitimate field for their permanent operation and many and more accurate data are needed as to their ultimate economy. In the columns of our London contemporary, *The Mining Magazine*, a discussion of the relative efficiency and economy of dredges of the California and New Zealand type, has raged for some months. It is now announced that the Philippine Exploration Company is to buy an American dredge. This, with the one starting next year at the Kolchan mines in Siberia, and another to be erected in Burma, should give additional data on the operation of California dredges under foreign conditions.

CHINA and its future have been much in the public mind recently, but apparently it would be well to take into account more of China at the present. Last April we had the pleasure of publishing an account of the Tayeh iron mine written by Mr. A. J. Stetzer, and in this issue we present an account of the Pinghsiang Colliery which, with the Tayeh mine, furnishes the raw material for the steel works at Hankow. The account is written by Mr. Karl P. Swensen, one of the young Americans who are, as teachers in mining schools, assisting our neighbors to an early conquest of their great natural resources. The account of these works has especial interest to the Pacific Coast States of America, since a considerable part of the pig iron used in Western manufacturing comes from these far away furnaces. Incidentally, much coke is also imported from there, since when loading a ship with pig iron there would be much vacant cargo space unless a lighter material were also shipped. The coke used to reduce Shasta County copper ore comes in part from Hankow. Recently the Chinese Engineering & Mining Company, Ltd., has arranged to enter the San Francisco market with coal so that northern as well as southern China is now sending fuel to our Western States.

SOUND common sense characterized the address of Mr. E. H. Gary, delivered before the American Iron & Steel Institute at Chicago recently. He pointed out that great progress has been made in this country during the last decade in the direction of improving the methods and morals of men. There has been, from time to time, reason to criticise the conduct of individuals connected with the management of large affairs, and the dividing line between right and wrong, between honesty and dishonesty, must be more definitely pointed out. The dishonest people in all departments must be driven from all positions of power and influence. It is not so important to consider the merits or methods of the individuals who have been prominent in the crusade for the betterment of conditions, indeed the criticisms themselves have not always been well founded, but they have resulted in benefit, and it is time for everyone to take a decided stand in favor of right conduct in matters concerning the great economic questions which involve the life, health, safety, and happiness of the whole people. In all this Mr. Gary has voiced the real sentiments of sober-thinking Americans.

Essentially his message is the same that Mr. Roosevelt has been delivering and it would be well to note that the head of our largest business enterprise and our most astute politician to give Mr. Roosevelt no higher title are together in this. Holders of undigested securities must not mistake effect for cause. The public has stopped buying not so much because of threatened legislation hostile to corporations as because dishonesty in high places has shown the need for regulative measures to make investment safe.

Mine Rescue Cars

An interesting feature of the campaign against mine accidents that will be waged this year in the United States, will be the use of mine-rescue cars. The Illinois Commission has ordered three and the United States Bureau of Mines six, of which the first has just been delivered and started west. The cars are re-constructed Pullman sleepers, courteously furnished at nominal cost by the Pullman Company, which has shown great interest in the work. Aside from living quarters for the men, shower baths, and office facilities, there will be a gas-tight chamber in which men may be trained under working conditions in the use of rescue apparatus. It is proposed that each car shall work in a limited district, being at all times subject to call in case of accident. Between times the car is to travel from mine to mine, stopping a week or more at each to train a crew of local miners. This plan of taking the instruction to the men rather than of attempting to get the men to come to fixed stations, will, it is thought, operate to more quickly educate a large body of men in the new methods and tactics. At the same time the engineer in charge of each car will become personally familiar with the mines in his district and will thus be prepared to act intelligently in assisting the local and company officers in case of a disaster. In addition to the mining engineer, the mine rescue foreman, and the cook, each car will carry a man thoroughly familiar with the methods of first aid work, and instruction along this line will be offered. The men for this work have been selected from among members of the excellent first-aid corps that have done so much to improve conditions in the anthracite mines. It is hoped that similar corps can be organized in the bituminous districts. Incidentally the engineer in charge of the car will be prepared to give lectures on explosives and other subjects closely related to the regular work of the miners, and by every means possible the attempt will be made to educate all concerned in the mining industry to greater care, to the end that the mines may become safer. Eventually the States and operating companies must assume the burden of this work, but temporarily, and as an educational measure, the United States Government is assisting. The 'Seed Specials' of the agricultural stations are thus paralleled in the new mine-rescue cars, and just as the railways found a car the best medium for instructing their men in the use and care of air brakes, it is hoped that the new rescue cars will supplement, if they do not supplant, the mine-rescue stations. For the present the work will be mostly in the coalmines but when there is time and conditions are favorable the greater metal mining camps will also be visited.

Static Electricity in Ore Dressing

Electrostatic treatment of ore offers many interesting possibilities. So far attention has been concentrated mainly upon the separation of blende from pyrite. In the last six years a number of mills have been built to apply static electricity to treatment of these ores. While considerable tonnages were treated as early as 1905, principally with the Blake machines, on the whole the first attempts were not commercially successful. The difficulty seemed to lie in the generation and control of the current rather than in its application. At that time the approved method of producing static electricity was by use of a revolving mica plate such as ornamented class rooms and doctor's offices a generation ago. The current available was a function of the size of the plate that could be made to hold together while rapidly revolving. No method was known of driving these machines in series, though at the plant at Butte, Montana, where there were sixteen generators, the operator once succeeded for a few minutes in getting them synchronized. As this was accidental the feat could not be repeated. Insulation also afforded many difficulties, and it was found that the temperature and humidity of the air in the work room was of large importance. In Wisconsin, where one of the first mills was built and run, excellent concentrate could be made on some days, while on others, for reasons baffling explanation, no satisfactory separation could be effected. At Butte the attempt was made to keep the generators at constant temperature. At Salt Lake ore had to be run and re-run, until the profits ran away. Despite all these difficulties and failures, enough was learned to demonstrate conclusively that the method would be of large importance if only static electricity could be generated and controlled as were other electric currents. Experimental work was concentrated on this point and success has been attained. It is now possible to convert an ordinary alternating current into one having extremely high voltage and low amperage, which is essentially the static current. At Coram, in California, where Mr. F. G. Cottrell is working on precipitation of smelter fume with such a current, a voltage of 30,000 with a volume of a small fraction of one ampere, is regularly used. By means of ingenious devices the mere crest of each electric wave is picked off. In Boston, where the Huff Electrostatic Separator Company has been carrying on careful work for some years, other means of accomplishing similar results have been devised. In another column of this issue Mr. H. A. Wentworth, manager for this company, tells something of the range of applicability of the machines now perfected. At Platteville, Wisconsin, and near Salt Lake in Utah, they are already in use, and no one familiar with Western conditions doubts that their success means much, especially in the development of the zinc resources of the West.

The Pinghsiang Colliery

By K. P. Swensen

It is generally known that great progress is being made in the commercial and industrial development of China. The program of reform, as it is being carried on by the Chinese Government, calls for the Westernization, so to speak, of national affairs that will enrich the country and her people and put China on a par with other nations in trade relations. The upbuilding of modern industries is one phase of China's future growth, and what has already been accomplished is perhaps not yet fully realized by those who take only a casual interest in China. The future of China's financial condition depends to a large extent upon the development of the mineral resources, particularly the vast quantities of coal and iron that are known to exist. It may be stated concerning the actual condition of the development of the mineral industry in China, that small progress is being made except in certain coal and iron fields. This is due to the refusal on the part of the Imperial Government to grant mining concessions to foreigners. The strong feeling of distrust which is inherent in the Chinese character even toward each other, also bars them from seeking foreign engineering advice where Chinese capital is available for mining enterprises. The most striking instance of the presence of China's mineral resources and proof of the ability of the Chinese to develop them, is the Han-Yeh-Ping Coal & Iron Co., which comprises the Hanyang Steel & Iron Works, the Tayeh iron mines, and the Pinghsiang colliery, the three having been recently consolidated to form the above combination with a total capitalization of $20,000,000. This company is constantly increasing its equipment and output and can now turn out with its three modern blast-furnaces 500 tons of pig iron per day. Its steel plant consists of four open-hearth furnaces, one mixing furnace, cog mill, beam and angle mill, rail mill, plate mill, and other plants, capable of rolling about 1000 tons of finished product per day. This company is already making its competition felt in the American pig-iron market, while it supplies a large quantity of iron ore to Japan, as well as coal and coke to different parts of the Orient. The organization may well be considered as a nucleus around which industrial development and production will centre, and eventually make China a formidable competitor among the nations of the world. In the Province of Shansi alone, where considerable investigation has been carried on, it is estimated there are over 600,000,000,000 tons of coal, and in a single mine in the Pinghsiang district there is said to be tonnage enough to yield an annual supply of one million tons for the period of 200 years, with much more in prospect. When the number of high-grade orebodies now being developed is also considered, the great wealth of China as an iron and steel producer can begin to be appreciated.

The Pinghsiang colliery is situated in the Province of Kiangsi, close to the eastern border of the Province of Hunan. The locality has always been known to contain an immense quantity of coal, and the Chinese have been digging into these from the surface at points on the outcrops so far as their superstitions would permit. They used most of the coal thus obtained in the manufacture of coke. The mine is about 300 miles south of Hankow by way of the Yangste and Siang rivers to the port of Chu Chow; thence 60 miles eastward by railroad to Nganyuen. Pinghsiang is an ancient walled Chinese city about five miles distant from Nganyuen. The mine has an interesting history, and there was much trouble in getting started, because of its inaccessibility and difficulty in the movement of materials and supplies, and particularly because of the fact that the people of this part of the country, who are of a strong and fearless type and devoted to their traditions, were strongly anti-foreign and religiously opposed to the opening of any mines whatever in their country. In the face of many difficulties the mine started operations in the year 1898. There were strikes and revolts, and several times the foreign engineers were forced to flee. The last serious trouble took place in 1906. Order is now completely restored and the mine has been steadily improved in equipment, and its output constantly increased, until it ranks favorably with the best in the world. Too much praise cannot be accorded to the foreign engineers, who are all German, headed by Gustavus Leinung, for what they have accomplished in the building of this plant and the difficulties they have overcome. It is a pleasure to know that the foreigners in this mine have the confidence of the Chinese who are the owners and business managers, and further that these officials were even willing to borrow the sum of $3,000,000 from the Germans during the early life of the mine, with which to put it on a secure working basis. The loan was made ten years ago and it is now repaid, so that the Chinese are relieved of all obligation to the foreigner. It would be a great boon to China if more of its officials in control of mineral lands awaiting development would follow the example of this company in obtaining initial capital through foreign loans. The speedy development of China's immense mineral resources would be the result.

It is a surprise to a stranger to visit this mining camp. Riding over the railway from the Siang river to the mine, he is given a magnificent perspective of the typical Chinese landscape in a prosperous rice-growing section. From the mountain heights, irregular small ranges succeed each other into the valleys to blend with the foothills in a maze of terraced rice fields. One marvels at the thrift of the Chinese farmer and the intensive culture to which he is forced to resort. All this the traveler looks upon and wonders at the still crude methods of labor, when he suddenly finds himself thrust into the industrial city with its multitude of chimneys and substantial brick buildings, which have been built on such a modern scale by the Pinghsiang Colliery Co. As the mine is in the heart of China, far from the source of machinery supplies and the like, it is necessary to keep complete repair shops as well as shops equipped to manufacture,

as far as feasible all necessary machines and appliances. This saves the time and expense incidental to ordering from abroad. There is a large round house to accommodate the dozen or more locomotives and a large railway machine and repair shop. In the main machine shop are manufactured steam engines, concentrators, pumps, lathes, and in fact almost everything in the heavy machinery line except electrical machinery. A foundry in connection turns out castings up to three tons weight.

An important adjunct is a series of coke ovens along the railway tracks. These ovens are of the Otto Koepe type of which there are 300 in operation. Almost all the coke is supplied to the blast furnaces of the Hanyang Iron & Steel Works at Hanyang. The coal used consists of the fine material saved from the washing plants and runs not over 10% ash and under 0.05% sulphur. In appearance the coke resembles that produced in the by-product

ELEMENTARY ANALYSIS

Carbon	87.944	88.060	60.167	59.921	54.118
Hydrogen	1.006	1.241	5.030	4.500	4.000
Sulphur	0.041	0.050	0.610	0.500	0.500
Oxygen	1.890	0.450	6.000	7.000	7.000
Nitrogen	1.001	0.959	1.153	0.979	0.992
Hygroscopic water	2.553	0.040	6.000	3.100	3.000
Ash	10.940	11.100	21.000	14.000	21.000

ANALYSIS OF THE ASH

Silica	47.91	48.500	45.000	40.000	47.000
Alumina	41.00	41.000	35.000	34.000	34.000
Oxide of iron	4.00	4.000	15.000	20.000	5.000
Lime	1.10	1.00	2.00	0.50	0.50
Magnesia	1.20	1.500	2.000	4.00	2.000

MELTING POINT OF THE ASH

Fusible melted at C	1,450	1,450	1,300	1,350	1,350

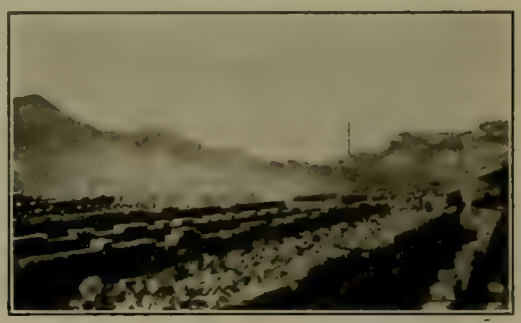
HEATING POWER AND EVAPORATIVE EFFICIENCY

Capacity of heat (Cal.)	6951	6862	5690	5402	6815
Quantity of steam at 100 C produced by 1 kg. of Pinghsiang coal from water at 0 C (kg.)			12.07	11.62	10.69

An instance of the broad-minded and commend-

Pinghsiang Colliery, General View.

Transportation of Coal From Railroad to Barge.



Coke Ovens at Pinghsiang Colliery.

ovens of the United States with a somewhat more silvery lustre. Up to the present, by-product ovens have not been installed for the reason that there has been no market for the tar and ammonia produced. Now, however, there is a good demand in Japan and 60 by-product ovens have been ordered from Germany. Anticipating good use for the tar, the company has erected a briquetting plant, having a capacity of 200 tons of briquettes per day. The briquettes from this plant have been tested in the marine service and have proved satisfactory. Analyses of the coal and coke are given in the accompanying table:

ANALYSES OF PINGHSIANG COAL AND COKE

	Foundry Coke	Smelting Coke	Navy Coal	Washed Coal	Run-of-Mine Coal
ANALYSIS IN THE CRUCIBLE					
Fixed carbon	87.944	88.060	60.167	59.921	54.118
Volatile	....	....	30.290	24.240	23.490
Combined water	1.119	0.840	1.953	1.149	1.392
Ash	10.940	11.100	7.590	14.690	21.000

able attitude of the engineers in charge, their devotion to the cause, and desire to help the Chinese in every particular, is seen in the recent establishment of a school of mines for the purpose of training Chinese in the profession of mining engineering. The school is already equipped with the necessary apparatus and has all the requirements found in the ordinary college course with the exception that the theoretical subjects are not pursued so far. A three-years preparatory course is required before students are allowed to enter the mining course which continues from 4 to 5 years, the first year being devoted to actual work, and study in practical mining and allied work. This is the policy now generally pursued in the technical colleges of Germany. The students are to be given every facility for supplementing the class-room work with the study of the practical methods as carried out daily in the mine, and vacation months must be spent in actual work about

the mine and the company will supply and allot the positions. There are now over 60 students in the preparatory course.

The mine is opened by a principal adit 3000 metres in length, and by another short adit which connects with a main working-shaft 170 metres in depth, and a ventilating shaft 110 metres deep. The shafts are round in section, brick-lined, 4½ metres and 4 metres respectively in diameter. Recently a large Fraser & Chalmers hoisting engine with reel and flat rope has been installed preparatory to deep sinking. At the present time all the coal mined comes out through the adits. The beds are now being opened continuously downward and the shafts are to be increased in depth as required. In the main haulage ways trains of cars are drawn by electric locomotives of 10, 40, or 50 hp. each. These were the first electric locomotives used in China and were started in the year 1906.

A feature of the surface operations is two coal-washing plants that were found to be necessary in the production of a grade of coal suitable for coking purposes. The coal is sent over shaking screens which give 4 sizes after the lump is run off over a 30 mm. screen. The material is then washed through a series of coarse to fine jigs, the light products of which all go to the coking ovens while the waste is discarded. This waste is given to independent Chinese coke manufacturers who re-wash the material by hand and turn out large quantities of good grade coke in simple rectangular ovens. This coke is sold for fuel. Fire-bricks of all grades and sizes are manufactured here and are of use especially for the coking plant and the furnaces in the steel works at Hanyang. A large amount is sent into the Oriental market and the demand for the brick is steadily increasing.

Regarding the underground workings and discussion of geological features of the mine, the management prefers not to give complete information for publication at this time. The engineers are working on a report that will give in detail the history of development and describe the technical features of interest. The country rock consists mostly of soft sandstone, and in the mine itself is found a hard limestone with many bands of slate and shale, as well as a large amount of soft clay partings in the coal seams. A great amount of development has been accomplished, and while the real life of the mine is largely conjectural, workable coal reserves have been developed to an extent that gives assurance of a supply that will last several hundred years with an output of 1,000,000 tons annually. The present output is about 600,000 tons per year. The coal is bituminous, there being a hard and a soft variety. The hard coal is found in the smaller seams, and those are worked running from 15 to 75 centimetres in thickness. For the extraction of this coal it is necessary to take out a large amount of slate, most of which cannot be used for filling, but must be conveyed to the dump on the surface from the mouth of the mine. There are 8 inclined tracks running to the slate dumps which are already of immense size. Such a mine as this could not be worked profitably in the United States on account of the high percentage of slate since the labor cost and the cost of washing would be prohibitive. In China, however, miners are paid less than 13 cents gold per day, so that the labor cost is relatively low. There are three hard coal seams of large extent having a pitch of about 12 degrees, which are from 3 to 6 metres apart. They are mined by the ordinary long-wall method, in which the entries are run with the dip and along the strike and all the coal is extracted while advancing. This system of long-wall mining is also used in the soft coal seams, of which there are six. These seams vary in thickness from 3 to 12 metres. Drifts are run for the purpose of ventilation every 20 to 25 metres along the haulage-way and connection made about 70 metres distant from the main gangways to provide the air circulation. In the thickest seams blocks are removed to 3 metres in thickness, and, while the roof is supported with props, the open space is filled with waste and the second cut proceeded with.

The greatest difficulty is found in the maintenance of haulage and passage-ways, because of the tremendous pressure. This makes timbering an expensive item, for the timbers must be constantly replaced. No attempt is made to relieve the pressure on the main timbers by providing auxiliary sets as is sometimes done for swelling ground in America. The roof is allowed to fall until it becomes low enough to interfere with the workmen, when it is cut down and new sets put in. This happens as often as once every four months in certain parts of the mine. The main haulage-way is lined with brick with an arched roof where the pressure is greatest. At other places the roof is supported by steel rails and lagging with brick walls. In the endeavor to maintain permanent haulage-ways where the pressure is great, as many as 10 courses of brick have been used in the arches and in many cases these have failed and crumpled under the pressure. This is the only way the engineers have of ascertaining the relative pressure although such trials are very expensive. In the matter of handling the labor, the management has found it an advantage to let out the greater part of the work by contract to Chinese foremen. It is a policy that is found to be particularly successful with the Chinese. They must be driven to doing right and habitually disobey orders unless constantly watched. The mining of the coal is done at a stipulated price per ton, varying with the conditions of mining, and the contractor must guarantee a minimum of 10 to 12% ash, before his output is accepted. Timbering and tunneling is done at an agreed price per metre. The coal and coke are dumped into steel cars and conveyed over standard track to the port of Chu Chow at which point, along the river, are lined up steel and wood lighters, with barges and junks of various description. These are towed to Hankow by the company's tug-boats in lots of about 1200 tons. At present there is a fleet of 13 tugs employed and the facilities and number of craft are constantly being increased. The handling of the coal affords an instance of how necessary it is to adopt methods to suit conditions in a

strange country. There is no need for the use of large capacity automatic loading devices such as are used in America, for in China labor costs but about one twentieth of what it does in America. The coal after being dumped on the ground along the track in great piles is conveyed by Coolies who use carrying poles with baskets attached holding perhaps a bushel each. There are several hundred of these men constantly at work moving from 1800 to 2000 tons of coal and coke per day from the railroad into the barges.

Transportation is handicapped during the winter season because of low water in the upper Siang river. This difficulty will be eliminated as soon as the railroad is built to the city of Yoh Chau, situated at the head of Tung Ting lake on the Yangste river. Here the company has already bought land on the river front for a future permanent shipping point. The Chinese Government recently purchased the 60-mile Pinghsiang railroad, and is grading an extension of that line from Chu Chow to Chang Sha, a distance of 63 miles. The line will soon be completed to the latter point, which will then replace the port of Chu Chow until the railroad is built to Yoh Chau. A feature of the Pinghsiang Colliery Co.'s operations is the growth and progress, these being evident in the output, in the resultant enlargement and improvement of the plant. The engineers and managers endeavor to turn out high-grade products. The success of the company furnishes an example for future undertakings and gives an insight into what may be expected from the eventual development of China's immense mineral and coal deposits.

Tayeh Iron Mines. Property of the Han-Yeh-Ping C. & I. Co.

Electrostatic Separation

By Henry A. Wentworth

Although electrostatic separation has now been known for some years even recently I have been approached by engineers of the highest technical standing and questioned concerning its uses and the difference in principle between it and magnetic separation and in such manner as to indicate that the principles of electrostatic separation and especially the manner in which they differ in character and application from those of magnetic separation, are not thoroughly understood even by the technically trained man. Electrostatic separation depends principally upon the difference in electrical conductivity of the particles in a mineral mixture. If we break the circuit of an ordinary lighted incandescent lamp, and insert in the break a piece of dry quartz, the lamp remains without current. On the other hand, if we insert in this break a bar of metallic iron, we immediately have light, which is also the case if we insert therein a piece of pyrite. Thus the pyrite conducts the electric current or charge while the quartz does not. Under the high voltages used in electrostatic separation, many minerals not electrically conductive appreciably at the low voltage used with the incandescent lamp, readily allow the flow of current through their bodies or over their surfaces. Moreover, the ratio of electrical conductivity of the best to the poorest conductors is measured in the millions.

Magnetic separation, on the other hand, depends

for its successful operation upon differences in the magnetic permeabilities of the minerals to be separated; in other words, some of the particles must possess to a greater degree than do others that quality which causes iron to be attracted so strongly to a magnet. Thus, magnetite is strongly magnetic, as we say, and, occurring as an ore of iron, in a matrix of non-magnetic rock, is readily and vigorously withdrawn from the crushed mass when a magnet is brought sufficiently near to it. Few minerals, however, are so easily influenced by a magnet as is magnetite, and thus we find it necessary, in order to utilize the low permeabilities of such minerals as marmatite, garnet, etc., to construct much more powerful magnets. Referring again to electrostatic separation, most of the common sulphides are excellent conductors of electricity, blende being a fortunate exception. Most of the gangue rocks are very poor conductors. Thus one sees immediately the field of application of the principle. As is usual with something comparatively new, the field to which it was first adapted, was that in which no other method had satisfactorily solved the problems. In the realm of complex ores containing zinc, there has been worked out a system, which, although not universally applicable to such ores, is found adapted to a surprisingly large number of our American problems of this nature. The common constituents of these complex ores in the sulphide zone are: galena, pyrite, chalcopyrite, blende, and gangue materials. Of these the galena is comparatively heavy, the gangue materials light, and though there be differences in the specific gravity of the other constituents, these differences are so slight that they seldom offer a means for commercial separation. From a furnace standpoint, it is essential, for maximum recovery at minimum cost, that the lead product (that product which contains sufficient lead or is of such composition as to be accepted by the lead smelter man), be as free as possible from zinc; that the copper product also be as free as possible from zinc, and for reasons of economy, from lead also; and that the zinc product approach, as nearly as it can be made economically, pure zinc sulphide—galena, pyrite, and chalcopyrite being objectionable impurities.

So, in the procedure above referred to, by a mill of jigs and tables, or other means for utilizing the gravity principle, the galena is removed, often clean unless the pyrite be high, when some of this mineral is carried with the galena in order to obtain high lead recoveries, with no detriment to this product as a rule: the gangue rock is washed away; and there is left for separation a mixture of chalcopyrite, pyrite, and blende, all of approximately the same specific gravity. This material is then dried but not roasted, and passed over electrostatic separators, whereupon the highly conductive pyrite and chalcopyrite, together with the remaining galena, are thrown from the blende (or the blende drawn out of them, according to the type of machine used), making products of relatively high purity for the respective smelters. Blende sometimes occurs in association with heavy gangues such as barite and fluorspar. Though ordinarily a very poor conductor, its conductivity can be altered easily and cheaply, making it, superficially, at least, an excellent conductor. Blende occuring in a matrix of barite or fluorspar is often chemically of high purity, so that in these cases the separation gives for a zinc product, a material analyzing high in metallic zinc. Another of these special problems is illustrated by the separation of chalcopyrite and other copper sulphide minerals from such heavy gangues as garnet and epidote. Many bodies of garnetized limestone contain, as their economic mineral, gold or silver-bearing chalcopyrite. Usually the concentration of this mineral in such cases is easily accomplished by electrostatic separation, and it is expected that the commercial perfection of electrostatic separation to the point which it has now reached will promote the rapid development of ore-bodies of this nature, of which there are many in North America, and several extensive bodies are now under active development. There are several special fields to which it is readily seen such a principle as electrostatic separation can be successfully applied, but in the consideration of these special fields, it must not be forgotten that this principle is applicable, and efficiently so, to the usual concentration of sulphides from ordinary gangues, and in dry regions, where water is not readily available, it is in a class entirely by itself. More than this, because of the high efficiency of separation electrostatically with those ores to which it is adapted, a very interesting problem is at present being worked out, whereby at some of the big copper mills using gravity concentration, a lower grade concentrate can be made on the tables, thus permitting a much higher recovery of contained copper, and then this concentrate may be cleaned of its silica by electrostatic separation.

I would also say to those interested in the zinc ores of this country, a few words which, though somewhat foreign to this general talk, I believe will be of interest. In discussing the many patents which it has been my duty to study embracing the numerous principles utilized in ore-dressing mechanisms, there has arisen the question oftentimes, as to whether, if a device were for utilization in the dressing of zinc ores, it would be applicable to the great mass of zinc tailing at Broken Hill, Australia. In many minds, therefore, it seems strange that the fairly successful solution of the Broken Hill tailing problem, has not resulted in the immediate like solution of the problems of our American complex ores. So far as I know, there is nowhere another deposit in quantity, which resembles this occurence at Broken Hill. In most of the American complex ores, pyrite and chalcopyrite play a very important part, whereas at Broken Hill, these minerals are present in the tailing only in small quantities. The problem there is the concentration of a blende high in combined iron (and probably manganese), from several heavy gangue materials, such as garnet, rhodonite, and rhodochrosite, there being no necessity for separation of iron and copper from the concentrate when the gangue is removed. In most of our problems, the essential difficulty lies in the separation of these minerals from the blende before the latter can be marketed advantageously.

Bonanza Copper Mine

By Victor H. Wright

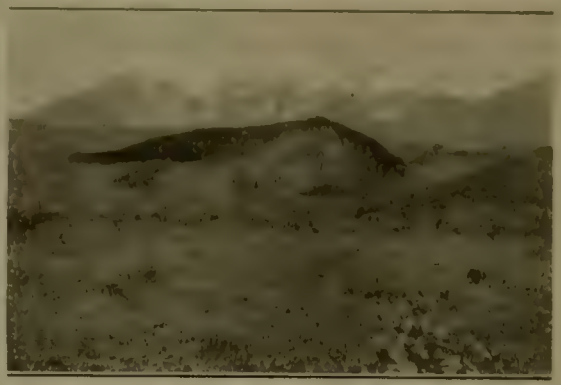
The Bonanza mine in Alaska is the objective point of the Copper River & North-Western railroad, 200 miles in length and costing approximately $22,000,000. The railroad runs through an abso-

Flag Point Bridge on the Copper River & North-Western Railroad.

lutely undeveloped district possessing no agricultural possibilities. It is financed by the Morgan-Guggenheim syndicate, and will be a scenic marvel. The first 40 miles of the railroad follows tidal flats.

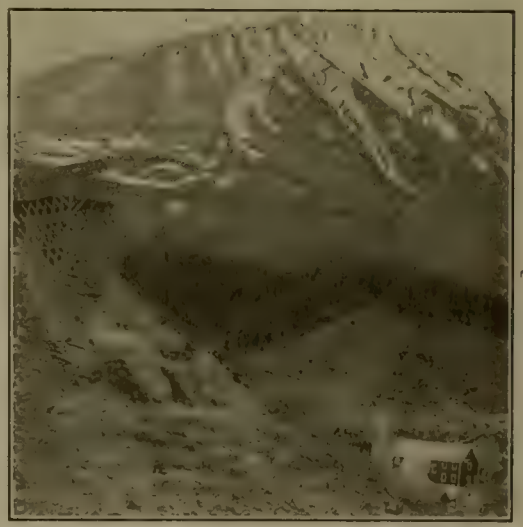
Upper Ore-Bins at the Mine.

At mile 50 is the Miles Glacier bridge. Leaving this magnificent piece of engineering, the railroad is built in solid 'rock-work' up the Copper River canyon. From mile 132, the railroad proceeds eastward paralleling the Chitine river at a distance of a few miles to the mouth of the Nizina. The Nizina is followed to the Kennecott, 4 miles from the mouth of which is the lower camp of the Bonanza mines. The camp consists of the bunkhouse, messhouse, warehouse, barn, assay office and the saw mill operated by steam. All the machinery and supplies have been freighted from Valdez, 180 miles distant, by means of horse-sleds, at a minimum cost of 14c per pound. R. F. McClellan, who grub-staked one of the original locators, is the superintendent, and Steven Birch is general manager. The lower camp is connected with the mine by a Bleichert tramway, 15,000 ft. in length, with a difference in elevation of 4000 ft.



The Range From the Railroad. The Arrow Indicates the Situation of the Mine.

The tramway has a minimum capacity of 300 tons in 24 hours, and cost $400,000, most of the cost being due to freight. The tram discharges at the lower end in bins, directly beneath which, on the hillside, a concentrator will be built, foundations for which are being laid. There are in all about 2000 ft. of mine workings, the highest adit being at an alti-



Lower Ore-Bins.

tude of 6200 ft; the lowest about 100 ft. below.

The ores are chalcocite and azurite, the latter appearing on the surface of the chalcocite. From the lower tunnel a raise passes through 40 ft. of solid chalcocite, no limestone being visible. There is also

a 235-ft. drift running through the same ore, all walls showing solid chalcocite, with cross-cuts of 20 ft. showing the same. At present 6 men are working at the mine, though 30 are employed at the lower camp. The track for the ore-cars runs from the main adit to the upper ore-bins over a slide which is said to average 20% copper. This slide contains boulders of chalcocite weighing as much as 200 lb. It has been estimated to contain $8,000,000 worth of copper. The tramway and concentrator have been built to handle the ore from the slide. A switch-back and main adit to tap the ore at depth has been planned for the main orebody, which is 40 ft. thick and of undetermined extent in other directions; it dips back and down, so that the two original adits driven in at the outcrop run through it and situated 100 ft. below, found ore at a distance of 100 ft. The ridge of the mountain shows an immense outcrop along its entire length. The same company owns the Jumbo mine, which is said to be an even more extensive property.

INVESTMENT POSSIBILITIES OF NEW DISTRICTS

By A. H. Martin

The average mining investor is prone to purchase stock first and investigate afterward. Lured into haste by the glittering prospectus laid before him, and fearing that he will be unable to secure the offering at present prices, unless he send in his money by return mail, or by telegraph, the investor parts with his cash. A few weeks later doubts assail him, and he proceeds upon a tardy investigation, often with the result that his golden illusions vanish, and he comes to the conclusion that mining is a swindle. Had he exercised the same care in his mining venture that he does in ordinary business pursuits, the investor would have been spared financial loss, and would have been able to select stocks of merit. The ordinary stock-buyer is inclined to place too much reliance on the local newspapers sent out by a certain type of promoters. He believes that the camp publications portray conditions as they exist, entirely overlooking the fact that most of these papers are anxious to bring in capital to exploit new ground, and are usually subsidized by the companies they are booming so zealously. He does not consider the effect of environment, nor how easily the minds of men are excited in a new mining district by surface indications. In most instances the discovery of a small streak of rich ore in the outcrop is hailed as the discovery of a new Mohawk, and the far-away investor, reading the account of this discovery in the booming camp journal, concludes that the times are propitious for the garnering of fortunes. For accurate news from mining districts, the investor will find it to his interest to consult the news columns of a reputable mining journal. By means of various experts' reports, the editor is able to detect any attempt of the correspondent to over-state the fact, while his familiarity with the industry at once shows him whether reports are unduly exaggerated. The average correspondent of a mining journal is an all-round experienced man in the industry, and is careful to avoid statements reflecting on the accuracy of the publication he represents.

Proof that high-grade ore exists in a district is not always a demonstration of the district's merit. The ore may be of such a refractory nature that its treatment involves a long haul to distant smelters, with attendant heavy transportation cost, or it may necessitate erecting a costly reduction plant at the mine. The mining literature of many promoters sparkles with allusions to $1000 ore, but it is not stated that this grade is only occasionally found, and in such small quantities as to make it of little importance. Again the prospectus may describe the development of a vein of $100 ore, without stating that this is found in a small streak of the vein, which may not run above $5 per ton throughout its entire width. The safest way of determining the merit of a new district is to consult the reports of recognized engineers and geologists. These men, through long acquaintance with various districts, are not influenced by every find made in new territory, but are rather inclined to question every report, and to doubt until convinced by irrefutable evidence. Accordingly the reports of such experts may be considered as accurate, with a tendency to moderation instead of exaggeration. Too much attention should not be paid to the statements of irresponsible talkers, for many of these people have claims to sell and highly color every discovery reported. It has been said that the small investor should never invest in any but a proved mine. To invest in prospective producers is speculation, though to the man who is willing to risk his money in speculating, the mining industry offers possibilities of tremendous magnitude. The claim of today, with stock selling at 5c. per share, may be the bonanza of tomorrow, with stockholders declining offers of many times the former price. Many great fortunes have been made by buying stock in a prospect. Still this does not constitute a safe investment, for the chances are overwhelmingly against an unproved claim. Ordinarily the buyer secures a big block of stock, and when the company fails, loudly proclaims that mining is a gamble, with the cards stacked against the unfortunate victim. Yet if that same man were asked to put his money in a business venture in which the chances against success were evident he would denounce the promoter. The great trouble lies in the fact that he failed to investigate adequately before he bought. Aside from the question of ore reserves, the power, water, and transportation conditions of a district are large factors in the successful operation of properties. High gold content of ores may be more than offset by excessively high operating costs. In this way the mine with $50 ore often proves less remunerative than a property containing $5 ore but which is situated in a district where working costs are low. In investigating a new district, all these factors should always be given due attention.

Turn-sheets of steel are used in the best regulated mines in preference to turn-tables, as the latter, if not well built, give much trouble and require many repairs.

The Black Hills of South Dakota—V

By William H. Storms

Not the least interesting of the economic deposits of the Black Hills region are the placers of the central Hills. These placers are of several periods, geologically speaking. At Rockerville is found an ancient conglomerate, similar to that near Deadwood and like the latter lying at the base of the Cambrian. These Cambrian deposits are the most ancient placer deposits in the Black Hills, if not in the world. The other forms of placer deposit in the central Hills are the high and low bars along the various streams, formed many thousand years ago, when the beds of the streams were at the level where these bars are now found. The most recent auriferous deposits are the gravels now forming the beds of the streams, and some of the dry gulches tributary to them.

The most important streams to the placer miner are Castle and Rapid creeks, and some of their tributaries, although gold is also found on Battle, Spring, and French creeks, and some of the smaller streams tributary to them. Other gold-bearing creeks, in which the amount of gold found was smaller than in either of those mentioned, were Beaver creek, in the southern Hills, and Box Elder, Elk, and Boulder creeks in the northeastern portion. The reason for the irregular distribution of gold in these several streams seems to be wholly due to the occurrence or absence of metallic gold in the veins and rocks through which the streams have cut their channels. As a matter of course, a stream that has cut through a region of gold-bearing rocks, will be gold-bearing throughout its length, from the point of entering the auriferous zone to its mouth, whether the lower portion of the stream be within gold-bearing formation or not, and a stream, which in its meanderings, crosses and re-crosses the gold belt, will probably be enriched to a greater extent than that which crosses the best of auriferous formations but once.

Examination of a map of the central Black Hills, on which is indicated the position of the numerous gold quartz mines, will show that these mines mostly occur within a belt of schists, approximately 5 miles wide at the northern end, near Nahant, on upper Rapid creek, but somewhat wider southward—Mystic lying near the eastern border and the Golden West mine, 5 miles southwest of Rochford, being near the western edge of this zone of auriferous schists and slates. In length the golden strip extends at least 20 miles in a southeasterly direction to the Holy Terror mine, at Keystone, and some distance beyond Battle creek.

In the vicinity of Hill City the gold belt seems to be divided, one branch, the easterly one, going toward Keystone, the westerly one swinging around more southerly toward Oreville, Tenderfoot, the Grand Junction, and other mines on French creek, near Custer. The rocks in this somewhat illy defined auriferous belt, are mostly micaceous and hornblendic schists, and slates, some of which carry an abundance of small garnets, commonly called by the miners rubies. Greenstone dikes, large and small, are common in some portions of the belt, particularly in the vicinity of Rochford and Lookout. In the country about Hill City and southward, granite dikes are very common and in some of the beautiful parks near Custer, form prominent features of the landscape. Many of these granite intrusions are tin bearing. Throughout the area of the gold-bearing schists, huge reefs of hard, dense quartzite occur, but as far as I am aware they are not gold bearing, or only slightly so, though to the westward similar quartzites carry copper.

The degree to which the several streams were enriched with placer gold, seems to have depended largely, in most instances, upon local causes, such, for instance, as the occurrence of a vein or belt of schist in the immediate neighborhood, carrying gold, through which the stream must have cut its way. This applies more particularly to the larger streams, like Castle or Rapid creek, for there are many small dry gulches which were rich in coarse gold, but throughout the entire length of which no vein, or zone of schist, or other gold-bearing rock has ever been found.

These dry placers are rather difficult to understand. Most of them are in shallow 'draws' (a name for the flat depressions at the head or along the course of larger gulches), and are dry as are also usually, the larger gulches or ravines to which they are tributary, except at times of heavy rains, or perhaps in the spring when the snow is melting. Many of the richest draws were on the summits of high hills or ridges, with no higher ground in the vicinity from which the 'wash' with its accompanying gold could possibly have come. Often the material in which the gold was found on the hilltops was light, dry, and ashy—the most unpromising stuff in which to search for gold. Not only this, but in many cases the gold was found actually among the grass roots, or but a few inches below the surface, and often 2 or 3 ft. above bedrock, while little or no gold would be found directly upon the bedrock itself. Such instances were of comparatively rare occurrence, however, for as a rule the gold was found upon the bedrock, or in the crevices between the blocks, down into which it was frequently found to have worked its way to the depth of several feet.

Another curious thing about these high, dry placers was that the wash contained many pebbles foreign to the locality. Particularly noticeable were those of an extremely hard hematite, none of which could be found in place within many miles of these diggings. These fragments of hematite ranged in size from grains, like sand, to cobbles, as large as one's head. They were worn perfectly smooth and were almost polished by the attrition of the stream which brought them to their elevated position on the summits of these Castle Creek hills. Many tons of this 'iron-rock,' as the miners called it, may be seen about the old placer dumps of the region under discussion—on the tops of the hills, on the creek bars, and in the beds of the streams.

The only hematite ores at all like those found in

these placers, that are known to me, are to be found in the sedimentary beds lying to the westward of the placer fields, distant 8 or 10 miles. In the Cambrian and Carboniferous formations are to be found occasional small beds and nodular masses of hematite ore, although I never saw any there that were as hard as these pebbles of the placer region of Castle creek. A mile or two above Deerfield, on upper Castle creek, are large bars of gravel lying 15 to 25 ft. above the stream, which here runs through a broad open valley, that is, it is broad and open as compared with the rugged narrow canyon into which the creek plunges a few miles below Deerfield. These gravel beds, above Deerfield, contain the same kind of hard purplish hematite pebbles as those found on the summits of the hills near Castleton, and 600 ft. above the bed of Castle creek. It is important to note, however, that the altitude of the gravel beds near Deerfield is 6000 ft., and that the iron-bearing auriferous gravel on the summits of the hills near Castleton, are found at an elevation approximating 5500 ft., a difference of 500 ft. The distance in a direct line from the gravel bars above Deerfield, to the placers near Castleton, is 7 miles, which gives an average fall of over 70 ft. to the mile, a grade sufficiently heavy to have carried the detritus of the high placers to their present position from the higher country west of Deerfield, at a time when the Algonkian schists and slates had not been eroded as deeply as we find them now, and when a stream may have existed, the only evidence of which remains in these deposits of gravel on the tops of the hills, and which have long since been greatly modified and distributed by erosion, a condition not difficult to understand in a region subject to the terrific downpours and cloud-bursts that are known to occur in the Black Hills, even to the present day.

Notwithstanding the fact that the placer wash of the higher bars and that on the hilltops came from the region miles to the westward, the gravels did not become notably gold-bearing until the ancient streams entered the auriferous belt. Within this zone the gravels all contain some gold, and in places the deposits were rich, thousands of dollars being washed from each of numerous small gulches or draws. Such were Hoodoo, Moonshine, Friday, Grasshopper, and some others. The gold was uniformly coarse, nuggets worth $2 to $20 being common, while fine gold was comparatively scarce. As a result of this condition the miner either had good diggings or he got practically nothing for his labor. However, the personal equation was a large one, as it usually is. I have known good workers to labor steadily for several days without finding enough gold to pay for their salt, and then, in the same diggings, to find several nuggets in a single day, for the ground was what is known to miners as 'spotted.' Generally, however, the pay was more even than the above instance would indicate, that is, where there was any pay at all. Few miners had the patience to work day after day without finding something to reward them for their labor, and it is my belief that there still remains rich places in these diggings which were undiscovered by the early-day miners in their undue haste to select the best diggings always.

Rapid creek runs in a direction a little south of east, across the gold belt, and from the junction with its tributary known as the South Fork, makes comparatively few large bends. It was profitably gold-bearing from the vicinity of the forks throughout the remainder of its course through the Hills, but Castle creek is probably the most crooked stream in the Black Hills. From its sources in the high limestone plateau, near the Wyoming line, it flows in a nearly straight southeasterly course to Deerfield, just below which it takes a bend to the northeastward, and thence, with many a crook and turn, continues in that general direction to the vicinity of the Golden West mine, 2½ miles west of Lookout. About here it enters the gold zone, and the stream turns in an easterly direction entering a deep and rugged canyon. Throughout the auriferous belt the stream is very tortuous, winding its way in and out among the rocks of the gold region. It cuts through the old crystalline rocks from the Golden West mine for 15 miles to the junction of the stream with Rapid creek (the direct distance being about 7 miles), and the fall about 800 ft., or approximately 50 ft. to the mile along the stream. The fall of Rapid creek is much heavier, being about 100 ft. to the mile where it passes through the gold belt, in a distance of 7 miles, from the forks above Rochford to its junction with Castle creek, 2 miles below Mystic. As a result of these varied conditions Castle creek is richer in gold than Rapid creek, the former cutting through the auriferous rocks twice the distance that Rapid creek does, and having a lighter grade, the gold found lodgment in Castle creek more readily than in Rapid.

Southward from Castleton, now only a small cluster of houses, but at one time a good-sized and prosperous town, there have been found from time to time numerous rich quartz deposits, where mines have been opened, among them being the Queen Bee, the Gold Dirt, King Solomon, Bengal Tiger, and numerous others. The ore found in these veins, or lenses of quartz, in these mines in early days, was sometimes astonishingly rich in gold, and it was, without doubt, rich deposits of gold such as these, that enriched the placers, both the high deposits and the stream beds as well.

Some of the placers on the high ridges were peculiar and interesting. At one place, a few hundred yards from upper Hoodoo gulch, two little draws had been worked out by miners. These draws headed on a small flat, on the brow of a steep canyon, called Last Chance. They were not over 150 ft. in length, and the bedrock near the edge was less than a foot from the surface. The pay-streaks had been followed in these draws to within 30 ft. of each other at their head. A small tract of ground, nearly flat, separated them. It had not been worked. I came across this place, and while examining it the thought presented itself—"If these two draws paid well, why not the flat between them?" A sack of dirt was carried down into the canyon 300 ft. below and the result of paninng was over $3 in coarse gold. The place was then worked until it was exhausted and paid

about $1 a day when it paid it was not long. While working this ground the bedrock got deeper as the diggings diverged. Prospecting here developed the fact that the gold was to be found almost wholly on the grass roots 2 ft. above the bedrock. The hill sloped upward gently for a few feet and then the drainage was in the opposite direction. Just how the gold came to be lodged at this place on the surface of the ground which was a dry and ashy material for the most of the decomposition of soil mentioned, it would be difficult to say.

Half a mile from this point was a flat dry gulch known as Grasshopper, so called because the first miners in the gulch were from Nebraska. Tributary to Grasshopper were a number of small gullies and flat draws. Of these two attracted my attention. Each was about 100 yd. long, they were parallel, crossing the same formation and as far as one could see, were as much alike as two draws could be. They were not over 100 yd. apart. One of these draws produced several thousand dollars in coarse gold, the other, though tested by a dozen prospect holes, failed to show a color. Things of this sort were not an uncommon experience in these diggings. Gold was found in the most surprising places, but was often absent where any intelligent and experienced miner thought he had a right to expect to find it.

At two places on Castle creek gold was found in profitable amount where least expected. These occurrences were each over 300 ft. above the creek, and were found in a sort of depression between the spurs. They were about a mile apart. Generally bars, whether high or low, are on the points, or spurs, but these two places were back in the hollow, as it were, of the hillside. One of them was found by a tenderfoot, who knew no better than to prospect in such a place; the other find was due to the discovery of a nugget on the trail where it was exposed by the rain.

There were numerous bars worked with success along Castle creek in the early days, among them Sullivan's, Billing's, Driver's, and the Elkhorn bars. Driver's bar, although the smallest of these, was to me the most interesting. A prospector named Driver was the original locator, but he found no pay, and no less than a dozen others tried it later, but failed to find the pay-streak. At last one came who tried on the lower side of the bar, all of the other efforts having been confined to the upper side. This last one struck it, and worked the bar out. He was employed there for several years and took out a large amount of gold.

Castle creek is one of the largest and most beautiful streams in the Black Hills, flowing the year round. Bedrock is generally deep in the gold region and a number of attempts were made in early days to work its bed by sinking shafts, the water to be controlled by means of pumps, but these efforts were without success. At Sitting Bull (now Mystic); at Castleton, and four miles above that place near Wheeler Hill mine, pumping plants were installed, and although splendid prospects were obtained at each place, the miners were unable to control the water. At the last-mentioned plant the men succeeded in reaching bedrock at 30 ft. and drifted 10 ft. putting in two sets of timbers the men standing up to their waists in water. Then the pump broke down and could not be fished out. Notwithstanding all these drawbacks and difficulties gold to the value of $110 was obtained from bedrock in this drift, but the water drove them out and the bottom of the hole has never been seen since.

Among the men of those early days were some interesting characters. Many were miners spending nights in the saloons, the dance halls and at the gaming tables, as Castleton the resort of the day's hard toil. Others were careful living frugals, saving all they could. Some were reserved, taciturn, and non-communicative. Among the latter was one old fellow Dan Pugh. When the Montana crowd struck Hoodoo gulch, Dan was with them. He took a fancy to a certain location, just below a bend in the gulch, but a younger man got a stake up first. Dan said nothing at the time, but wandered on over the low ridge into the next gulch, which was Grasshopper, where he took up a claim and worked through the season alone, a dangerous thing to do, for Indians were bad.

Nightly, when the Hoodoo fellows would get out their sacks and gold scales and 'weigh up,' they would show from half an ounce to an ounce or more, each. Dan would sit silently by himself and carefully weigh out his little clean-up, meanwhile mumbling to himself, as he placed the golden grains in separate bottles—"That's for grub, that's for tobacco; that's for poker; that's for whisky; that's for me"—the entire amount seldom exceeding $2 or $3 daily, and none of it was coarse gold. With the approach of winter the ground froze and the miners began making preparations to leave the diggings on Hoodoo, from which they had already taken the cream. Weighing up for the season was going on, the various members of the party being able to show from a hundred or two hundred dollars, to over $5000, according to their success in the gulch, and to their frugality in spending.

Dan had declared his intention of remaining throughout the winter, and as usual, sat alone weighing up his little hoard. It seemed pitifully small for a man who was not a 'spender,' and some of the fellows, generous and kind of heart, quietly discussed making up a purse for 'Poor Old Dan.'

One of them said to him: "Dan, you might just as well have come in with us. You could have, you know, at any time, if you would, and had you done so you would now have a good buckskin full instead of that miserable little pile of dust."

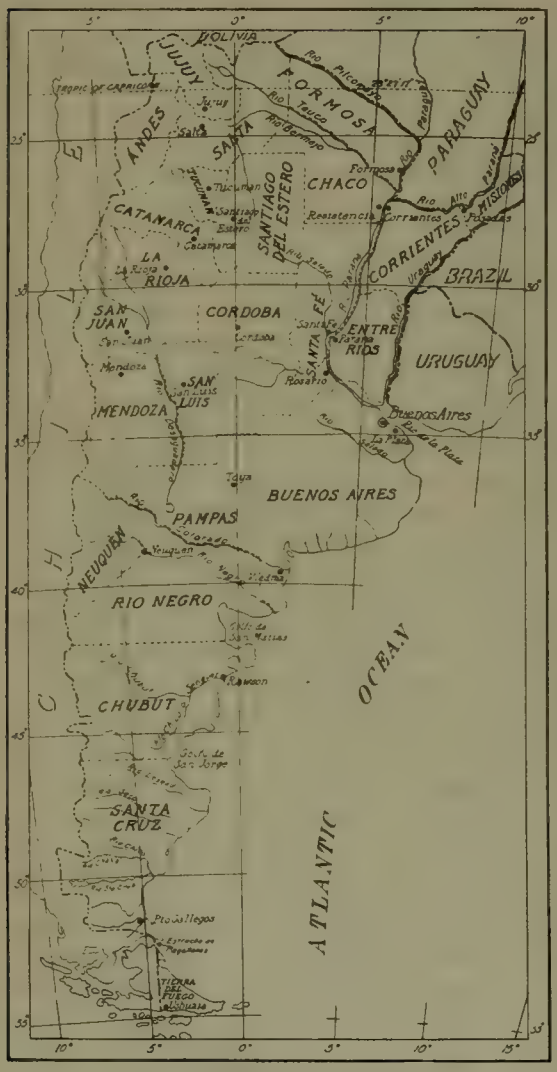
Dan nodded quietly, and with a sly twinkle in his eye, replied; "Thanks, boy. You mean well, I know, and I appreciate it, even if you did take the claim I first wanted, but this here little pile is my fine gold—now let me show you my nuggets," and the eager and astonished miners gathered round and watched 'Poor Old Dan' dig out from various receptacles nearly $15,000 in coarse nuggets.

They were simply speechless for a minute or two, and then they proceeded to open up on him in true miner fashion. Some laughed and commended him for his slyness while others cursed him roundly.

Mining in the Argentine

By Charles Janin

The mineral resources of Argentina have attracted little attention as yet, and the lack of transportation facilities has greatly hindered development. The prosperity of the country is due to the export of grains, live stock, and timber; the latter from the northern provinces. Some of the provinces are rich in gold, silver, and copper, and a few deposits of salt and borax have been successfully exploited. Petroleum is found in Mendoza.



Map of the Argentine Republic.

Chubut, and Neuquen territories. In general the climate is temperate and healthful, though in the extreme north it is very hot. The people are mostly Spanish by descent though there is a large foreign element, Italians being most abundant. A great deal of British capital has been invested in Argentina mostly in railroads. The standard coin is the gold peso which is worth 96.5c. Under the conversion law of 1899 a paper peso is worth 0.44 of a gold peso.

The gold districts, with the exception of those in Tierra del Fuego, are situated on the eastern slope of the Andes. The best known mines in the Republic are those of the Sierra de Famatina in La Rioja province where the Famatina Mining Co., an English concern, commenced work in 1824. These mines have had a varied career and have been closed down numerous times. In 1903 the property was taken over by the Famatina Development Corporation, Ltd. The region is barren so far as animal and vegetable life is concerned, while water is obtainable only by the melting of snow or ice. The ore is mostly copper but contains some gold and silver. Auriferous alluvial deposits are found in Jujuy province, in Famatina, and the eastern portion of Tierra del Fuego. Gold is also found in San Luis, San Juan, Tucuman, Catamarca, and Salta provinces. The goldfields at the head of the Neuquen river in the Cordilleras have been successfully worked for years by Chileans with their primitive methods of ground-sluicing. Dredging in the northern rivers has not hitherto been especially successful. In the Jujuy province the Orosmayo Gold Dredging Co. worked up to September, 1908, at which time operations were suspended. Another company, the La Orosmayo Segunda, abandoned its workings without having started its dredge.

In La Rioja province, La Compañia Rioja Aurifera, floated in Buenos Aires with a capital of $750,000, operated a dredge from September 1907 to February 1908, but afterward sold its holdings. A number of concessions have recently been granted for prospecting alluvial gravels, and while definite information is not at the present available, it is reported that several dredges will be installed. Considerable prospecting was done for tin in the Velazco district, but the ore developed, however, only averaged 1.5% and work was abandoned. In the Famatina district, the Famatina Development Corporation, Ltd. installed a 150-ton water-jacket furnace and four converters. The mines of the company are connected with the Ferrocarril Argentina del Norte by an aerial tramway, built by the Government at a reported cost of £200,000. The mining company built a branch line about 800 metres long. The Government tramway is a splendid piece of work. It is about 34 kilometres long and passes over many deep gulches, the longest span being about 840 metres. Work has been concentrated at the San Pedro, Upulongos, and Atacama mines. In January 1909, 204 men were at work, and during 1908 2754 tons of matte was produced. The mines are among the highest in the world, being 16,500 ft. above sea-level. The mountains at the back rise to an altitude of over 20,000 ft. El Obero Negro, the highest, is in the region of perpetual snow. The country rock is a metamorphic clay slate intersected with dikes. The mines are worked through adits, which in the Upulongos mine, reach a depth of 750 ft. below the surface. Considerable ore, having a value of 5 to 10% copper and from 0.2 to 0.27 oz. of gold, is said to be blocked out. The cost of mining including delivery to the smelter, is given at $5 gold per ton, and smelt-

*Part of this article has been tranlated from *El Padron Minero*, Buenos Aires, 1909.

ing at $6 per ton. Freight from the smelter to the steamer is $12 gold per ton of matte. The ore is rather treatable and there is considerable loss of fine material. To overcome this it has been decided to install a briquetting machine. About 500 nominal horse-power is obtained from water delivered through pipes about two kilometres long to Pelton wheels. La Compañía Minera Los Bayos which owns most of the mines at Los Bayos suspended operations during 1908 until a better method of ore treatment should be found. The ore averages less than 3% copper. The Rio Amarillo Copper Mining Co. has a 30-ton water-jacket furnace and treats a total of about 4000 tons of ore, producing about 600 tons of 45% copper matte. Most of this ore came from the San Juan mine. This company secured a legal suspension of operations for two years commencing October 1908. The Sierra de Minas district is attracting now more attention. gold, silver, copper, and lead ores are found, some veins containing free gold in appreciable quantities, claimed to be from 30 to 90 grams per ton. The ore shipped from one mine it is said averaged 53.8 gm. gold per ton. Wood and water are plentiful.

In La Carolina district, Province of San Luis, wolfram mines are successfully working. The ore is low in grade but hand picked ore and concentrate shipped to Europe average 65 to 70% WO_3. Considerable ore is claimed to be blocked out ready for extraction. The company washing the gravel on the Canada Honda is said to be meeting with success; the value of the ground worked is given at 5 to 25 gm. gold per cubic metre. The pay-dirt generally lies under a top soil of 5 to 7 metres. The onyx mines in the same district have been successfully working for some years.

In the Territory of Neuquen, the Neuquen Proprietary Gold Mines has a 10-stamp mill which began work in March 1908, and during the year treated 3680 tons of a gross value of 42,074 gm. gold, or $38,320 national currency. The mill treated from 16 to 20 tons per day of 24 hours, power being furnished by a Pelton wheel. The conditions of this district are favorable for gold mining; water is abundant and can be used for power at certain seasons, the Neuquen river alone constituting an enormous reserve. Wood is not always abundant. In the forests of Antuco and Lagunitas about 60 miles distant, wood is cheap; but transportation greatly increases the cost at the mine. The climate is good. In the winter season, June to September, there is some snow, but not enough seriously to interfere with the operation at established mines. The altitude of the known mines varies from 1000 to 1600 metres above the sea. Wages are rather high, being 5 pesos per day for miners and 2.50 to 3 pesos per peon, reckoned in Chilean money.* Contracts are taken for 25 to 35 pesos per metre for drifts 1.8 by 1 metre, and 30 to 35 pesos for shafts in rock of medium hardness. Explosives and candles are furnished by the company.

In the Territory of Las Andes, the mining district San Antonio de los Cobres is situated about 4200 metres above sea-level, and about 150 kilometres from Cerrillos on the Ferrocarril Central Norte. The district has few natural advantages. There is no pasturage for animals, water is not abundant, and there is little wood or other fuel except roots called *cuerno*, for which ₱20 a ton Chilean money, is paid at the mines. Freight on ore from the mines to the railroad is ₱35 per ton. The most important work that has been done in the district is at the Concordia group where a considerable tonnage of ore is blocked out. La Candelaria shaft is 148 metres deep with several drifts at various levels. Electric power is developed at the Chorrillos river, a short distance from the mine, by means of a 250 hp. turbine wheel, and transmitted to the mine at 4500 volts. During the latter part of 1908, about 5300 tons of ore was treated. The first concentrate assayed 6% copper, 30% lead, and 150 oz. silver per ton, but several improvements and changes in the machinery raised the grade to 7% copper, 35% lead, and above 200 oz. silver per ton. Wages paid average about ₱3 per day, Chilean money.

There are a number of old mines in the Province of Catamarca. The ores contain principally copper, silver, and some gold. Lack of transportation has been a serious drawback to development of the mines. It was expected by the end of 1909 that a branch of the Ferrocarril del Norte would be finished from Mazan to the mining district of Andalgala. The Capillitas Copper Co., in this district, has built two 50-ton water-jacket furnaces to treat its ore. The Capillitas mines have been worked without interruption since 1853. Freight on matte from Muschaca, where the smelter is situated, to Chumbicha costs ₱45 Argentine currency. This rate will be greatly reduced on the completion of the railroad. The Capillitas company has secured a legal suspension of work for two years.

Legally mines in Argentina come under three classes:

1. Mines of the first class which belong exclusively to the Government and require concessions to be worked by private parties. In mines of this class the ownership of the surface is entirely independent of the ownership of the mine. Under this head come: (a) gold, silver, copper, platinum, lead, iron, zinc, tin, nickel, cobalt, bismuth, manganese, antimony, arsenic; (b) coal; (c) bitumen and oil; (d) precious stones.

2. Mines of the second class are in two divisions, those which are granted in preference to the owner of the surface, and those set apart for common use and worked by whosoever desires under existing laws. The mines under the first division include deposits of borates, salts, mineral earths, and any metals not mentioned under mines of first class. Under the second division are (a) all kinds of metalliferous sands and precious stones in river beds; (b) placers; (c) tailing and slag piles of abandoned mines.

3. Mines of the third class belong exclusively to the owner of the surface, and comprise quarries for building material, and so forth.

*A Chilean peso is worth about 36.5c. United States currency.

Rapid Electrolytic Method of Analysis

By R. C. Benner

Electrolytic methods of analysis have for some time been of importance in giving a satisfactory and accurate means for determination of a number of elements. A great disadvantage as to practical application, however, has been the consumption of time in the deposition of the metal. The older methods, in many cases, required from 3 or 4 to 15 hours. Notwithstanding this great drawback, they have been successfully utilized in many places, for the determination of copper, lead, nickel, and other metals.

The rapidity with which a quantity of metal is deposited electrolytically, in weighable form, from a given electrolyte of definite volume, depends upon two factors: (1) Amount of electricity passed through the cell. (2) The number of ions present at the surface of the electrode.

The amount of any element deposited by the electric current depends upon its electrochemical equivalent and is proportional to the amount of electricity passed through the cell. In order that it be deposited in an adherent and weighable form the current must not be too high.

In order to be deposited, at any given instant, ions of the element must be touching the pole on which the deposition is to be made, and in order that this be true at all times, as long as there are any ions present in the solution, the electrolyte must be agitated, so that fresh solution is always being brought in contact with the electrode on which the deposition is being made. This fact had been utilized for many years by men making the deposition of different metals on a large scale, for other than analytical purposes, before the fact became impressed upon chemists working on electrochemical methods of analysis. This principle has been applied to this branch of analytical chemistry in different ways by many men, with varying degrees of success, and in the greater number of such trials the deposits have been as good, and have been made much more rapidly than by the older methods. They have, at times, likewise, allowed the use of electrolytes, which do not give satisfactory deposits by the slower methods.

In 1902 to 1903, F. F. Exner,* while working at the University of Pennsylvania, agitated the solution by the rapid rotation of the cathode and was enabled to deposit, in a weighable form, in from 5 to 10 minutes, from 0.25 to 0.50 of a gram of many of the metals. About this time, F. A. Gooch, at Yale, was working along the same line, but instead of rotating the cathode, he, in his work, stirred the solution by the rotation of the other pole or anode. His experiments were, likewise, very successful and show that agitation is, without doubt, the point to be considered in the rapid deposition of metals in a weighable form. A quotation from the work of Henry Sand, which states in a concise manner why the use of these high currents is possible, will not be out of place. He says: "It is most probable that high current densities are possible and depend solely upon the rapidity of renewal of the liquid at the electrodes. It is extremely likely that in metal precipitation the potential at the cathode is independent of current density. The great variations observed, when applying different current densities, are almost wholly the consequence of local concentration changes. The great role, which such changes, under circumstances, can play, I showed, four years ago, in the electrolysis of copper sulphate solution containing sulphuric acid. Just as long as copper ions, in appreciable concentration, were present at the surface of the touched electrode, those alone were precipitated. When, however, they had practically disappeared from this touched surface, all copper, migrating in that direction, was, by diffusion, set free simultaneously with the hydrogen. In all instances, as a consequence of the local exhaustion of copper sulphate, in spite of convection, heating, hydrogen evolution etc., over 60% of the current was consumed in liberating hydrogen. On agitating the solution energetically, copper alone was precipitated. Had the purpose of these trials been to determine copper, that metal would, in the first instance, have separated in a pulverulent form; in the second, in a coherent precipitate."

The different forms of apparatus, which have been devised to apply this principal to electrochemical analysis, have been multiplied almost indefinitely. Two will serve as illustrations. Fig. 1 represents one of the most simple forms, in which the cathode is rotated. The cathode consists of a platinum crucible, placed over a cork on the end of the motor shaft, by means of which it is rotated from 400 to 1200 times per minute. The anode, in this form of apparatus, is a common foil electrode, placed as near as possible to the side of the beaker, in which the deposition is made. Fig. 2 is another form of apparatus, in which the anode is rotated by any means at hand and the deposition made on the platinum dish, which holds the electrolyte and at the same time serves as a cathode. One of the more recent devices has been the application of the solenoid. By the utilization of this, it is possible to make the solution itself revolve, by means of the magnetic stress set up within it. This form of apparatus, while allowing of a more rapid precipitation of some of the elements than is obtainable by the older methods, is not equal, in this point, to the rotating cathode or anode.

Probably the apparatus which will prove itself of the most value, especially to the technical chemist, is the gauze electrode recently used by me for the determination of lead and copper.* This, while it has no more, and in many cases, not even as much, surface as the ordinary foil electrode, allows of the free circulation of the electrolyte, when agitated by the rapid evolution of the gas caused by the use of high currents. In form this has the advantage of simplicity and where applicable, it allows of a depo-

*E. F. Smith. 'Electro-Analysis,' 1907.

**Jour.* Ind. & Eng. Chem., Vol. 2, No. 5 and No. 7.

sition with extreme rapidity for electrolytic determinations. That is, it is possible to deposit all of the copper or lead found in a 0.5 gram sample of copper or lead ore in less than 20 minutes.

Another electrolytic device which deserves much more attention than has been as yet given it is the mercury cathode. This is nothing more than a beaker of 90 c.c. capacity, Fig. 1, with a platinum wire fused through the bottom or better at the edge, where the bottom joins the side. The platinum wire makes a contact with the mercury, which is placed in the bottom of the beaker, the electrode weighing when containing 40 to 50 grams of mercury, not more than 80 grams. The solution to be electrolyzed is placed in the beaker over the mercury an anode introduced and the mercury made the cathode by connecting the other pole of the battery to the platinum wire which was fused through the glass. By means of this simple apparatus, it is possible, with currents varying from 3 to 4 amperes,

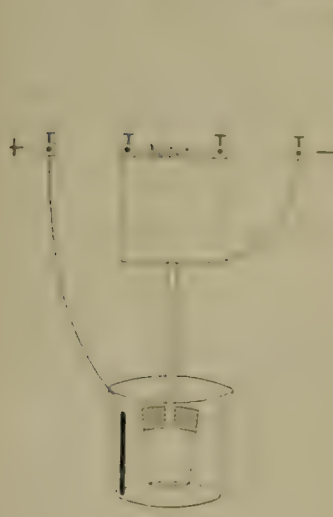


Fig. 1

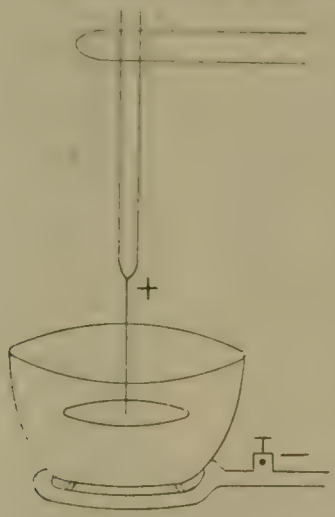


Fig. 2.

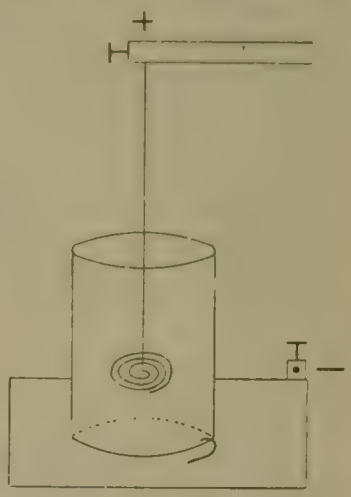


Fig. 3.

where 20 c.c. of the solution is used, to deposit as high as 0.5 of a gram of a number of the metallic elements in from 15 to 20 min. and, by washing with distilled water, alcohol, and ether, to make a determination as accurately as by most other methods, and in some cases, such as that of bismuth, with much more ease and accuracy. Again, some of the most difficult chemical separations can be successfully made by this method. The separation of iron and titanium, in a sample of titaniferous iron ore, will serve as an example. The iron can be quantitatively deposited in the mercury, from a sulphuric acid solution containing iron and titanium, if from 0.1 to 0.2 of a gram of iron be present and the volume of the solution is not too great, in as short a period as 20 minutes. The mercury cathode weighed, before and after, gives the amount of iron present. The electrolyte can then be reduced by zinc and the titanium titrated in the usual manner.

This simple form of apparatus shown in Fig. 3, gives results as quickly as can be desired in most cases. However, they can be obtained even more quickly, if, instead of the stationary anode, a rotating anode be used.

AIR CURRENTS IN MINES

That air currents in mines will have the effect of drawing out the natural moisture in the mine air is well known. In this connection a paper read recently by Erskine Ramsay before an engineering society of Alabama engineers is of interest. Mr. Ramsay said in effect that the amount of water an air current will take out of a mine in cold weather is surprising and startling. At Banner the ventilating current amounts to 200,000 cu. ft. per minute and for the purpose of calculation the inlet and outlet will be considered of equal volume. From the tables it is found that this volume of air when saturated and at a temperature of 40 F. will carry into the mine in 24 hours about 14,000 gal. of water in the shape of moisture. The same current, heated to the temperature of the mine, say 65 F., will carry out of the mine about 34,000 gal., thus robbing the mine of 20,000 gal. each 24 hours. Unless the mine is to be dried out and become dusty, this moisture must be supplied to the air current from steam jets, pools of water, hose, sprays, or other means. At Banner it is sought to supply by sprays at least a part of this loss. The 31 sprays now installed will deliver about 30 gal. per hour, and with all of them working, a total of over 22,000 gal. would be delivered during each 24 hours, or a little more than is taken out by the current.

An open-sight compass, to be really useful, should have the sights perfectly true, and in precise line with the zero lines on the ring. It should be provided with variation-plate in order that the instrument may be adjusted to the magnetic variation at any place that it may be necessary to use it. Its chief requisite is an accurately balanced active needle. An instrument possessing these requisites is sufficiently good for doing work that will prove fairly correct if proper care be taken. A surveyor's compass has the E to the left of the north point, and the W on the right. This is for convenience in reading the bearings of objects sighted from the point of view.

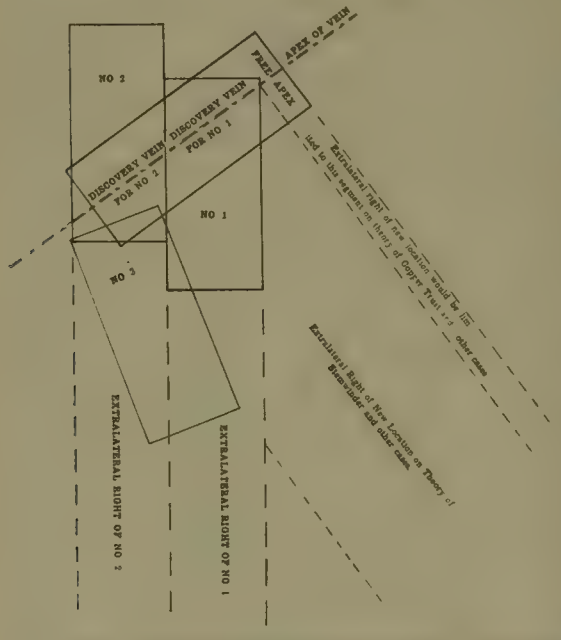
Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Extralateral Right of Cross-Vein

The Editor:

Sir—Would an overlapping claim, as indicated by the sketch below be of any value to the owner of No. 1 for the purpose of controlling a vein supposed to exist as indicated by the broken line?



In poin of time the claims were located in their numerical order. No. 2 and 3 are owned by another person. Has the owner of No. 1 a right to this supposed vein inside the lines of No. 1 without making this location? Would this location give the locator a right to work the vein across claim No. 2?

L. E. TAGGART.

Forks of Salmon, California, October 7.

[The following opinion in this case presents the possible diverse views: Insufficient data are given to discuss the question satisfactorily. The locator has not given the direction of the dip of the vein and does not state whether the vein indicated is the discovery or primary vein for both claims or whether it is only a secondary vein for either or both.

Assuming that it is a primary or discovery vein for both locations, No. 1 and 2, then by reason of the fact that the vein crosses both side lines of each claim, these side lines become end lines (or, more properly, side-end lines), in contemplation of the law, and their respective extralateral rights are determined by vertical planes passed through these side lines extended in the direction of the dip. Since the claims No. 1 and 2 are parallel, there would be no conflict of extralateral rights between them.

It is by all means advisable to place a location covering the cross-vein in the manner indicated on the diagram. There should be a segment of free apex of the vein (that is, apex that is not covered by either of the other claims) included in the new location, and the direction of the end lines of the new location will be determined by the particular sweep of extralateral segment of the vein that seems most valuable to cover. Of course, the new location could not detract from the extralateral rights of the senior locations, No. 1 and 2. The right of these locations would first be satisfied, and then the right of the new claim would come in to take whatever segment of the vein was left. The question as to whether the new location would have an extralateral right from end line to end line beyond the planes of the other extralateral rights, or only for so much of the vein in depth as it had of free apex in length, has not been finally decided by the Supreme Court of the United States. Lower courts have decided both ways, with the weight of authority perhaps in favor of the exercise of an extralateral right for the full length of the vein, in spite of the fact that part of it lies within a senior valid location.

Under no circumstances could the new location be given the right to any part of the vein lying within location No. 2 and beneath surface of No. 2. All this proceeds on the assumption that the vein in question is discovery vein for both No. 1 and 2.]

Mining Laws of Quebec and Ontario

The Editor:

Sir—I have read Theo. F. Van Wagenen's article in your issue of October 8. In it he compares the mining laws here and the class of prospectors with those across the line. There is little complaint made here with regard to the regulations governing the actual working of the mines, or with the staking out of claims. At one time, in British Columbia, extralateral rights were allowed, but this was done away with, and the British Columbia mining law is generally acknowledged to be the best on this continent. There is far less mining litigation here than in any camp as important as this across the line, and in any case the rightful owner gets a fair show, which is more than can be said of many Western American mining camps. Several of the bigger mines here are managed by Western American engineers, and they have little fault to find with the laws; in fact, I have heard them state they preferred them to the American mining laws, both as far as the prospector and miner are concerned. Mr. Van Wagenen states that the bulk of the work at Larder, Porcupine, and Gowganda, is that of claim peggers working in conjunction with share promoters. This it not true. I doubt if there is a camp on this continent as promising as Porcupine, where so little 'wild-catting' or 'stock-booming' has been done. His statement that Sudbury and Cobalt are the only two really proved mineral deposits in eastern Canada, surely is a reckless one and shows his utter ignorance of the country. If the genuine prospector is the kind of man that Mr. Van Wagenen describes, we are far better off with the class of prospectors in this country. They do not seem to have any trouble with the mining law, and for efficiency, they are

quite up to the general run I have found in the West. His contention that the regulations connected with the use of explosives, housing of men, and payment of wages make prospectors hard to find sounds absurd. Mr. Van Wagenen is quite wrong when he says it is doubtful if there is a prospector in eastern Canada, and that none will go there until the laws are altered. It would be better if Mr. Van Wagenen came to Canada to learn something about good prospecting and good mining laws before making such statements as these.

J. Edwards Leckie.

Cobalt, Ontario, October 20.

Northeastern Siberian Co., Ltd.

The Editor:

Sir: During the past year there have appeared several articles in *The Mining Magazine* and the *Mining and Scientific Press* with reference to mining conditions in northeastern Siberia, and to the Northeastern Siberian Co., Ltd., of which I was for years one of the managing directors. Statements have been printed to the effect that the Russian Government violated its agreement with the company and confiscated the company's gold, also that the company itself, in place of carrying on mining operations, was more particularly active in whisky trading with the natives. Both of these statements are wholly untrue. The company's concession covered an area of over 60,000 sq. mi., absolutely unknown as to resources or topography. To carry on prospecting for minerals and other development in such a large, unknown, and inhospitable territory without several bases of supplies would have been futile, so our first task became the construction of four supply stations. Upon our arrival in this territory, we found the natives in the most miserable condition of poverty and disease, largely the results of intercourse with the whaling ships. We decided to try to remedy this state of affairs, and in the course of six years we brought to these natives over 1,000,000 rubles ($500,000) in value in flour, sugar, tea, biscuit, tobacco, lumber, whaling boats, all classes of tools that could possibly be used by them, thousands of Winchester rifles and guns, as well as several classes of dry goods and wearing apparel, also stoves, clocks, lamps, sewing machines, phonographs, etc. Less than one-half of one per cent of our importations were alcoholic beverages. The result of our operations was to change the condition of the natives from one of starvation and disease to comfort and health. The truth of this was, and is, too self-evident to be disputed by anyone, except persons disposed to commit deliberate falsehoods. As for mining, the records and maps show, and fully establish, that we carried on continuous exploration over the whole of this large territory, not excepting the period of the Russian-Japanese war, and at a cost of several hundred thousand dollars, and these explorations resulted in the discovery by us of gold, both in placers and quartz, also of silver, lead, and copper ores, iron ores, and graphite, and our years of operations changed it from an unknown to a known territory. The story of the Russian Government confiscating gold is based upon a claim: overt act of one of the company's own directors, as Mr. Kovatsko of St. Petersburg, who took, in a rather disagreeable manner, about $10,000 in placer gold from the foreman of a sub-contractor. The Russian Government had no part in this transaction. On the contrary, the ministers of the Russian Government, by words and by deeds, displayed strong desires to aid in developing the concession territory. My seven years of experience in connection with Siberian development are far from satisfactory, but it was not lack of resources in the concession territory, nor unfriendly acts on the part of the Russian Government that made them so.

James Rossow.

Seattle, Washington, September 28.

Inhalation of Mineral Dust

The Editor:

Sir: Noting the query of 'Drill Runner' in your issue of October 15; is it not possible that the extreme conditions under which the miner works when operating drills afford one of the reasons why he is more liable to phthisis than are millmen? The latter, though in the dust, as a rule, do not exert themselves and are oftener in the fresh air. The trouble is not alone to be attributed to the dust, but in part to impure compressed air and to gases which tend to irritate the lungs. In drilling holes the cuttings are of a sharp form, while dust from crushing machinery in the mills may be of an entirely different shape, much finer, and not so injurious to the men.

B. L. Worthen.

San Francisco, October 22.

VOIDS IN SAND AND BROKEN STONE

A simple and accurate method employed by the Aberthaw Construction Co., of Boston, Massachusetts, for determining the voids in sand and broken stone for concrete work is given in the *Cement Age*, as follows: Apparatus necessary, a galvanized iron ash-can and platform scales that will weigh up to at least 500 lb. Weigh can empty and indicate weight by W. Weigh can filled with water and indicate weight by W_2. Weigh can filled with stone and indicate weight by W_3. Weigh can filled with stone and water and indicate weight by W_4. Subtract W from W_2 and divide by 62.4 to find the number of cubic feet in the can, indicate by C. Subtract W_3 from W_4 to find the number of pounds of water required to fill the voids in the stone or sand; divide by 62.4 to reduce to cubic feet and indicate by V. Then C divided by V will give the percentage of voids in the stone or sand. This method is used extensively by the Aberthaw company, and is accurate, convenient, and quick.

The right of eminent domain as related to mining does not obtain in California or Colorado, although some other States have recognized mining as a 'public use,' and condemnation proceedings for right of way may be instituted under such laws, and such proceedings have been sustained by the Supreme Court of the United States.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

In mica the black and brown geometric figures often seen are due to the presence of tourmaline. It unfits the mica for commerce.

For dampers in ventilating pipes use heavy iron plate. Thin plates are useless, for the concussion of blasts will cause the dampers to double up like paper, destroying their usefulness.

Crushing machinery, engines, and compressors should be placed on concrete foundations where possible, but not before the concrete is set sufficiently to prevent crushing under the weight of the machinery.

Crushing rolls require care in running. One of the most important things is to see that they do not get out of adjustment. If the edges of the rolls do not meet exactly a ridge will be cut on the face of each roll.

Zincblende is occasionally rich in gold. It is frequently high grade in silver and has at times been mistaken for tellurium, as was the case for several years at the Carson Creek mine, in Calaveras county, California.

On a patented placer claim, if, subsequent to the issue of such patent, a quartz vein or other ore deposit be found on the placer, it belongs to the owner of the patented location. Such a vein is not entitled to extralateral rights however.

A 10% grade means a rise or fall of 10 ft. in each 100 ft. In speaking of a grade of 500 ft. to the mile, the mile is measured on the slope and not horizontally. A slope of 10° is not the same as a 10% grade. The former is a rise of 17.2 ft. in each 100 ft. measured on the slope.

Illuminating oil was made in San Francisco, California, as early as 1865-67 by Hayward & Coleman, who were in the oil business. The illuminant was made from crude petroleum obtained near Santa Barbara. This firm also utilized the crude oil as fuel in their distilling operations and in making steam to drive their engines.

Tailing deposited on the land of another becomes the property of the owner of the land, if not immediately removed, and the land owner may work said tailing for his own benefit if it contain mineral of value. On the other hand, if the tailing is damaging to the land owner the person responsible for the deposit of such tailing may be held for any damage done.

The deepest gold mine at present in the world is the Victoria Reef Quartz mine at Bendigo, Australia, the shaft of which is 4355 ft. deep vertically, with a winze from that level that extends 203 ft. deeper—a total depth of 4558 ft. The winze has entered a saturated water-zone at that depth, a most unusual thing in very deep shafts, and it is thought further sinking in this and adjacent mines will be delayed, at least until this unexpected flow of water is under control. Until recently the shaft of the New Chum Railway Co. in Bendigo district was the deepest.

No taxes are imposed in the Argentine on mining properties nor the minerals extracted, and no duty is charged on ore or metals exported. The sole obligation of the miner under the code is that the mine be worked by at least four men for not less than 230 days in the year. Should this rule not be complied with, any person may apply for possession of the property as an abandoned mine.

Where mineral veins cross town lots in the Western mining States, the owners of such veins have the right to the mineral under the surface of said lots. In the event of buildings or other surface improvements being made prior to the commencement of mining operations under such buildings, the miner is responsible for any damage done to said improvements by reason of such mining operations.

When preparing to blast, the miner frequently overcharges the drill-hole, particularly when using a 40% or a lower grade powder. He has learned by experience that a large amount of powder is necessary to break the ground, particularly if the rock be tough. In accordance with this experience he places in the hole about all it will contain, reserving from 12 to 16 in. of a 50-in. hole for tamping. The result is frequently the blowing off of the collar of the hole, leaving the lower end ('boot leg') still in the rock. When this recurs several times it will be found the better plan to use No. 1 powder and high-grade caps, but it will probably not be necessary to fill the 50-in. hole more than one-third full of powder. The holes should break to the bottom and thereby save much time and expense.

The aneroid barometer can be used as a reconnaissance instrument only. For establishing ditch grades and similar lines of gradient it is too capricious. The daily variation while hanging undisturbed on the wall is considerable. For measuring differences of elevation between two points where the observation can be quickly made it is very useful, but if a considerable interval of time elapse the measurement will be unreliable. An excellent barometer indicated an altitude of 1600 ft. It was carried up a hill to the summit of a ridge where it read 1900 ft. Twenty minutes after the first reading, on returning to the gulch the instrument indicated 1615 ft., showing a discrepancy of 15 ft. This is the way of the aneroid barometer. The depth of a shaft can usually be determined with considerable accuracy if there be no delay in going from one level to another, or from the top to the bottom. If there be delay from one level to the next, take separate readings, and then take several trips, reading both top and bottom. From these several readings take the mean, which should agree closely with the actual figures as determined by leveling.

Special Correspondence

TOKIO, JAPAN

Output of Minerals in Japan. — Statistics of Coal Production.

	Quantity	Value, yen
Gold	112,741 oz.	5,290,705
Silver	1,678,070 "	4,660,716
Copper	75,526,128 lb.	24,385,118
Lead	5,760,658 "	447,615
Tin	38,240 "	30,817
Bismuth	260 "	1,508
Refined antimony	2,32,113 "	36,860
Antimony sulphide (crude)	102,000 "	9,220
Quicksilver	558 "	705
Zinc ore	16,790 tons	448,212
Cast iron	47,559 "	2,024,318
Steel	6,817 "	534,161
Pyrite	60,146,791 lb.	137,135
Chrome iron ore	1,170,833 "	6,913
Manganese ore	14,681,675 "	56,381
Arsenic	12,064 "	323
Phosphate ore	8,676,950 "	7,362
Graphite	473,686 "	27,657
Coal	11,986,103 tons	61,743,980
Brown coal (lignite)	94,390 "	165,183
Petroleum	66,181,040 gal.	6,369,925
Asphalt	9,301,358 "	89,093
Sulphur	59,530,160 "	55,695,100
Total		107,288,500

As the above figures stand, the mining output amounts to 107,288,000 yen, an increase of a little over 1,000,000 yen or approximately 1% over the preceding year. But as stated above, in spite of the increase of from 7 to 20% in the principal minerals, the small total increase as 1% resulted from decrease in price of other minerals, above all, coal, copper, silver, and petroleum. Following is the output for the previous ten years.

	Yen
1900	49,267,475
1901	56,705,085
1902	56,129,547
1903	57,475,811
1904	58,461,339
1905	78,101,797
1906	107,967,010
1907	112,015,607
1908	106,274,408
1909	107,288,500

Thus, as in the above table, the mineral output in this country is on the increase every year, and as compared with that of 1900, shows an increase of 90% in gold, 100 in silver, about 60 in copper, 40 in lead, 160 in iron, 150 in coal, 230

	Quantity, tons	Value, yen
China	1,269,783	718,842
Kwantung provinces (Manchuria)	20,733	126,820
Korea	99,637	535,509
Hongkong	912,138	5,631,179
British India	56,657	391,772
Straits Settlements	238,811	1,794,278
Dutch India	40,014	322,610
French India	22,287	167,717
Russian Siberia	25,524	171,566
The Philippines	70,053	480,573
England	35,328	176,648
America	28,774	151,833
Mexico	9	84
Hawaii	24,068	162,153

The Fushun mine, acquired by the Russo Japanese treaty, is full of promise, and is actively in operation, and there is every sign that its product will come into competition with the export from Japan proper.

MANILA, P. I.

Paracale District. — New Dredge to be Bought. — Tumbaga Ships to San Francisco. — Mambulao Iron Deposits. — Surveys by Division of Mines. — Mineral Production in 1909.

News from the Paracale district on the east coast of Luzon is encouraging though there is not as much excitement as there was some months ago due to an incipient boom, the district is really in better shape than it ever has been. The San Mauricio mill, with 20 stamps, is running steadily, having a large supply of ore in reserve. It is still too early to say what results are being obtained. A fine lot of samples came up from Tumbaga mine on the last boat. A large sample will be sent to the Selby smelter in California. A large part of the sample was crushed and assayed in the Division of Mines, the assays running nearly $2000 per ton. This all comes from two 4-in. streaks of calcite in brecciated shale from two raises on the first level. Some of the specimens are exceedingly rich, showing free gold and galena all through the calcite. The minerals in these veins are calcite, quartz, galena, zincblende, gold, and tellurides. At this mine there is a shaft 97 ft. deep to the first level, and 86 ft. below the first level. There are 225 ft. of drift on No. 1 vein of the first level besides 60 ft. of crosscut and 70 ft. of drift on No. 2 with a winze 36 ft. deep. Vigorous development work continues on the Nalasvetan, Navotas, and Leduc properties. There are only two dredges working in the river near Paracale. The Philippines dredge, which was found unsuited to the ground on

the Paracale river, has been moved to the Malaguit and a bar of gold has already reached Manila from there. The Paracale dredge, the pioneer of the district, has a new pontoon and is working just below its old position on the river. The Stanley dredge has closed down for the present. Testing on Gumaus river has exceeded expectations and on the strength of the results, William Kane, of the Philippine Exploration Co., which has control of some property on this river, has gone to the United States to procure a Bucyrus dredge and the necessary force to run it. It is hoped that a large dredge of the Bucyrus type may soon be placed in the district as it is believed that a great saving can be made by a large dredge. Considerable attention has been given an iron deposit on Calumbayuma islands at the mouth of Mambulao bay. This deposit has been found to continue on the mainland to the south. The Division of Mines has completed a reconnaissance of southeastern Luzon, the field work having been in charge of G. I. Adams. Within a few months a larger party will probably go to the Paracale district for detailed work. The triangulation of the mining district was completed several months ago. The district now has telegraph and telephone connections with the outside world and an extension of the new railroad to Nueva Caceres has been proposed. News from the Benguet district is not so complete. A 6-stamp mill has been set up by the Major Mining Co., and is about ready to run. The plant will be in charge of E. B. Frost, of California. The Headwaters company is erecting its mill, but it will be two

Natives Breaking Rock.

months before it will be running. Arrangements have been completed to restore the plant at the Bua mine in the Antimok valley, which plant was partly destroyed in the typhoon of October 1909. Just what will be done on the Benguet Consolidated property has not been decided. There is talk of consolidating the Benguet Con. with the Camote property. There are many reasons for thinking that this would greatly benefit both properties. Options have been taken on several of the properties but things are still in the formative state. In Masbate, the mill of the Colorado Mining Co. is expected to be running about the first of March. Development is proceeding on several of the properties in this district but there is no indication of immediate operation. Recently samples from placers were brought in from the east coast of Luzon due east of Manila, but no further particulars are available. F. T. Eddingfield, mining engineer in the Division of Mines, is engaged in making a preliminary survey of tne Agno Placer Co.'s ground in the Pangasinan province. The Agno flows through the heart of the mineral district of north and central Luzon. The Government coal mine on the west end of Batan island has shut down. A party from the Division of Mines is engaged in making a report for the division commander in the Philippines. Work in the East Batan mine is proceeding satisfactorily. Samples of coal are being collected by the Division of Mines to ship to the Bureau of Mines in Washington for briquetting tests. A gas-producer is being installed in the Bureau of Science in Manila to handle the Batan coal which seems to be particularly suitable for this purpose. The coal deposits in the Philippine Islands are extensive and constitute the most important mineral asset of the country. Several mining engineers from Germany and America are making examinations of various mining fields in the Philippines, and in spite of many setbacks the outlook is more encouraging than ever before. The Division of Mines has issued a pamphlet covering the mining fields during the calendar year 1909. Copies of this bulletin can be secured by applying to the chief clerk, Bureau of Science, Manila. The mineral production for 1909 as estimated from reliable sources, amounted to ₱2,240,047 or $1,120,023. The gold production, while not large, was still in excess of 1908, it amounting to $274,507, the Benguet district leading. Coal amounted to $98,592, and iron to $15,539, most of this coming from three small furnaces owned and operated by a Tagalog woman near Angat in the Bulacan province, Luzon. The output of these crude furnaces is made into plowshares and sold to the natives of the neighboring province.

PARK CITY, UTAH

American Flag Mine.—Its Extent and Workings.

The American Flag mine, situated in Empire canyon, Park City district, Utah, has three veins in quartzite. The main vein strikes north 36° east, dips east 79°, and varies in width from 1 to 6 ft. The gangue material is fragmental quartzite, accompanied by talcose matter in many places. There is also a good deal of iron and manganese. The ore carries gold and silver and varying amounts of lead and copper. The gold is not free, and the silver occurs as chloride, sulphide, and bromide, with small quantities of native silver. The oxidized ore extends to the depth of 1100 ft., below which level the sulphides occur. The hanging wall is quartzite, except on the north drift of the eleventh level where it is limestone; the foot-wall is also quartzite, except where it is displaced by porphyry on several of the south drifts and limestone on the ninth and eleventh levels. The east vein, which has been exposed only on the latter level, lies 75 ft. east of the main vein, and has a strike north 60° east. Therefore it diverges from the main vein on its course north, and intersects the main vein on its course south. The dip of the east vein is 85° west, and it is thought that it will be found to dip into the main vein at a depth of 200 ft. vertically below the eleventh level on the latter vein. The east vein varies in width from a few inches to 1 ft., and it is regarded as a spur from the main vein. Both walls are quartzite, the vein filling is similar to that of the main vein, and the metals, in the order of their relative value, are gold, silver, and lead. The Rodin vein, the first opened on the property, has been mined to a depth of 225 ft. below the level of the Curtis tunnel, which was driven from the bed of Empire canyon. A considerable tonnage of first-grade ore has been mined and shipped from this vein. Its strike is north 35° east, the dip 79° southeast. The bedding planes of the quartzite dip 20° northeast. The Silver King limestone lies above and the Ontario limestone lies below the American Flag quartzite, but the latter limestone has not been found in these workings. There are 9825 lineal feet of development on the American Flag property, consisting of an 1130-ft. vertical shaft, 1590 ft. of cross-cuts, 3100 ft. of raises and winzes, and a 225-ft. incline shaft. The mine production, from August 3, 1904, to September 30, 1908, consisted of 6130 tons of a gross value of $232,879, or an average of $38.12 per ton. The shipment of 2420 tons during another period brings the total production up to $272,235, being an average for all of $31.84 per ton. The gold content averaged $7.58, and the silver $24.26 per ton. F. V. Bodfish and R. L. Mack, of the American Exploration Co. of Colorado, which has a long-term lease on the mine, have prepared an assay sheet showing the quantities of lead, silver, and gold and their total value as the result for 77 samples taken from all parts of the mine. This shows that silver takes first place, gold second, and lead third. The sample lowest in silver assayed 0.3 oz., the highest 303 oz.; the sample lowest in

gold ran 20s. the highest $2.50. They have also prepared a longitudinal section and assay map outlining development indicating values of samples at places from which they were taken. Mr. Hedfish makes definite recommendations as to future development and the costs of same which will require the expenditure of $5,500. The property is well equipped with hoisting machinery, air compressor, and power plant.

LONDON

Flotation Process at Broken Hill — North Broken Hill. — Chillagoe Company —Mining in Egypt.

The latest news from Broken Hill is that the Zinc Corporation is to adopt the process of the Minerals Separation Co. in the extension of plant recently decided on. The Zinc Corporation was formed by Berwick, Moreing & Co. five years ago for the purpose of treating by flotation the large dumps of zinciferous tailing resulting from the dressing of the silver-lead ores of Broken Hill. The hot acid sulphate process of Potter was at first adopted, but after extended experiments was rejected and that of the Minerals Separation Co. adopted instead. This was given a short trial and abandoned. By this time the finances and prospects of the corporation had become decidedly gloomy. Further money was raised and the Elmore vacuum plant built. Great success has attended the venture since and handsome profits have been made. Some months ago the economic position began to alter, for the average content of the material treated began to fall. At the beginning of operations it was only natural that the best parts of the dumps should be selected, with the inevitable result. In order to maintain the profits with lower grade material it became necessary to increase the scale of operations. During the last three years the plant of the Minerals Separation process has been vastly improved and its efficiency increased. At the same time the design of the plant has been so simplified that its first cost and the cost of operations have been reduced; so much so that the directors of the Zinc Corporation have decided to adopt it. This should give an opportunity for comparing the efficiency and cost of the two processes working side by side under the same management. Not only have the flotation processes been improved but of recent years the lead-dressing practice at Broken Hill has advanced. At the North and South mines the new plants are giving excellent results, and some particulars of their performance will be of interest. The Broken Hill South Silver Mining Co. suffered during the first half of 1910 from the coal strike and during the greater part of January and February operations were at a standstill. Nevertheless the results for the half-year have been good. The new concentrator was erected by the beginning of 1909, but did not start work immediately owing to the difficulty of securing suitable terms for the sale of lead concentrate. Later in the year contracts were made and the mill was fully employed by the middle of the year. During the four active months, March to June, 132,757 tons was mined and delivered to the mill, assaying 15.2% lead, 12.8% zinc, and 6.4 oz. silver. The weekly rate was 6987 tons as compared with 6424 tons the previous half-year, and the metal content showed an increase of ½% in lead and zinc and ½ oz. in silver. The concentrator produced 20,735 tons of lead concentrate averaging 72% lead, 21½ oz. silver, and 5.2% zinc. The zinc tailing produced was 58,915 tons assaying 18½% zinc, 4.2% lead, and 3.7 oz. silver. Some of this tailing went to the Zinc Corporation, but since March the whole output has gone to the De Bavay company. The Zinc Corporation still treats the old dump material of which there is over 1,000,000 tons on hand. The De Bavay company also owns 143,000 tons of old dumps. In addition 215,809 tons of slime has accumulated, averaging 12% lead, 15% zinc, and 6 oz. silver, to be treated when a suitable process is available. The system of filling old stopes with quartz tailing has been extended, and additional rock filling is being provided from a quarry. Developments at the mine are encouraging and on the new level at 1070 ft. the orebody is as valuable as in any part hitherto opened. The cost of mining during the last half year was 10s. 2d. per ton; development 1s. 8d.; the stopes 1s. 1d.; concentrating is of total 1s. 10d. The total cost, including extra expenses due to the coal strike, was £125,670 and the income from sales of lead concentrate and zinc tailing was £151,274, leaving a profit of £25,604. Out of this £3000 went in payment of administration expenses and taxes and £6566 was written off for depreciation. A dividend of £20,000 was distributed.

The North Broken Hill Co. is in a satisfactory condition. Not only are developments in the mine excellent, but the new concentrating plant is a great success. During the half year, ended June 30, the third and final unit of the concentrating plant was put in operation and the amount of ore treated per week has been increased from 4000 to 5200 tons. The total ore sent to the mill during the half year was 108,943 tons assaying 15.4% lead, 6.4 oz. silver, and 12.9% zinc. The production by jigs and tables was 17,912 tons of lead concentrate averaging 70½%, lead, 20½ oz. silver, and 6.6% zinc. In addition 53,688 tons of zinc tailing was produced averaging 17% zinc, 3.6 oz. silver, and 3.9% lead, this was delivered to the Amalgamated Zinc (De Bavay's) company for treatment. A small plant has been erected for the experimental treatment of the slime, of which 11,568 tons was produced during the half year, assaying 12½% lead, 15½% zinc, and 7.8 oz. silver. The working cost at the mine during the half year has been 9s. 4d. per ton; at the mill 3s. 1d., and development 1s. 5d., a total of 13s. 10d. The total cost was £77,714 and the receipts from the sale of concentrate and tailing was £124,688, leaving a balance of £46,974, as compared with £33,899 the previous half year. Out of this profit, £2426 was paid for office expenses and taxes, and £17,783 was allowed for depreciation. The dividends absorbed £28,000 being at the rate of 16% for the half year. The details given by the manager, George Weir, relating to recent developments in the mine are of unusual interest. Owing to an alteration in its pitch, the southern orebody has been found on the 1100 ft. level at a distance farther away from the boundary than was expected and consequently more ore will be found in this level than on the 950-ft. level. Moreover the content of the ore is higher than the average. This company did not suffer from the recent coal strike.

The Chillagoe company which is registered in Victoria was formed in 1898 to work copper-lead deposits in North Queensland, and has been twice reconstructed. The capital now stands at £500,000 in shares of 10s. each, and in addition there are £773,000 debentures. The company also owns a railway from Mareeba to Chillagoe and has nearly completed a further line, 145 miles long, to Einasleigh and Etheridge. The company has a smelting plant at which its ores and those of the subsidiary Mungana company and custom ores are treated. E. A. Weinberg is consulting engineer, E. J. J. Rodda is mine manager, and J. Horsburgh is metallurgist. The amount of ore raised from the company's own mines is much less than formerly; in fact, the mines are for all practical purposes non-producing. The ore purchased from the Mungana company has been of less value than formerly. If it had not been for ore purchased from the New Einasleigh mine at Etheridge, which is now becoming an important producer, the metallurgical work would have shown a great contraction, and even as it is the furnaces have been running only part time. Recent development has been confined to the Zillmanton mine where work was resumed in August of last year. There is about 40,000 tons of copper ore available for extraction at this mine. During the year ended March 31 the lead furnaces treated 20,051 tons of ore mostly from the Mungana mine and produced 2042 tons lead, containing 137,318 oz. silver, and 5658 tons of matte containing 1061 tons copper and 140,111 oz. silver. The copper furnaces were occupied during the earlier part of the year in the treatment of this matte, but later on, the Mungana lead-copper ore contained so much less lead and so much more silica that it was treated direct in the copper furnaces, so sacrificing the lead content. The amount treated in this way was 8290 tons. The copper furnaces also treated 16,964 tons of copper ore from New Einasleigh. The total output was 2735 tons copper, 283,860 oz.

silver, and 1798 oz. gold. The profit for the year was £88,348 which was earned entirely by the railway; out of this £26,540 was paid as debenture interest and £56,016 written off for mine development and for depreciation of plant. A great deal of work has been done in the investigation of other properties. Of these the most promising seems to be the Big Reef near Charleston in the Etheridge district which in earlier days was worked for gold in the oxidized zone and now is being developed in the sulphide zone.

Mining in Egypt has during recent years been disappointing and though many old gold deposits have been re-opened the results have been indifferent. At the present time the developments at the Barramia have once more attracted attention to the country. The company was formed by John Taylor & Sons in July, 1909, to acquire from the Egypt & Sudan Mining Syndicate, the Barramia gold mine which is situated between the Nile and the Red Sea, 63 miles from Edfu on the Nile. The capital of the company is £55,000 divided into 216,000 10% non-cumulative preference shares of 2s. 6d. each and 112,000 ordinary shares of 5s. each. The purchase consideration was £28,000 in ordinary shares, £1350 in preference shares, and £5000 in cash. The remaining 205,200 preference shares were subscribed in cash by shareholders in the vendor and allied syndicates. The preference shares, in addition to the 10% dividend, are entitled to $^{27}/_{35}$ of the subsequent profits in any one year. The mine has a 5-stamp battery erected by the vendor syndicate. The property was worked by the ancients and it has the characteristic of containing ore-shoots of high value. The vendor syndicate has extracted 1460 tons of ore which yielded gold worth £17,190. The work of the present company has been to hasten developments. During the year ended June 30, 583 tons of ore was extracted yielding gold worth £15,727, and a profit of £3276 was made, so that it has been possible to distribute 10% on the preference shares, absorbing £2700. An additional 5 stamps and other plant are being built, and plans made for a cyanide plant to treat the tailing which assays as much as 8 dwt. Motor traction is being established for communicating with Edfu to supplement the present camel traffic. The report by S. W. George, the superintendent, shows that the mine is in a promising condition and that in several places the ore is highly profitable. He foreshadows the provision of additional plant which will be required for the economical exploitation of the veins below the 250-ft. level. Mr. George is resigning owing to desert life not suiting his health and Arthur J. Rickard is succeeding him.

TONOPAH, NEVADA.

Results of Milling Operations.—Important Developments.— Tonopah-Belmont.—MacNamara.

The Tonopah Mining Co. is mining and milling an average of 15,000 tons of ore per month, this having been the record of the last seven months. The average value of this ore was $22 per ton, of which $6 was gold and $16 was silver. A. R. Parsons, superintendent of the company's 100-stamp mill and cyanide plant at Millers, gives the milling costs at $2.76, and the extraction at 92%; the cyanide consumption was 3.28 lb. per ton; zinc, 1.77 lb.; lime, 9.32 lb.; lead acetate, ½ lb. per ton of ore. There has been little change in milling methods within the last two years, except that the proportion of slime has been increased. As now practised, 46% of the ore is cyanided as slime, and 54% as sand. About the only new equipment added was a Trent agitating tank, 36 ft. diam. by 20 ft. deep. W. H. Blackburn, mine superintendent, states that the Sand Grass 2-compartment shaft has reached a depth of 550-ft., and has been equipped with an electric hoist. This shaft was sunk for the purpose of developing territory at the west end of the company's group. No lateral work has been done as yet.

The West End Mining Co., for which S. H. Brady is manager, has done 3500 ft. of development since April last, and has shipped to the Kennett, California, smelter, 6768 tons of ore of an average value of $20 per ton—$5 in gold, and $15 in silver. The ore for these shipments was taken from stopes above the 400, 300, and 200-ft. levels. The principal orebody is known as the West vein, having an andesite hanging wall, and a rhyolite-dacite foot-wall. The vein width runs 4 to 20 ft., the pay-streak being next to the foot-wall; the gangue consists of quartz, with some rhyolite. Sinking from the 400-ft. station is in progress, the intention being to open a level at 500 ft. The steam-hoist is being replaced by one to be operated by electricity; the air-compressor is now driven by an electric motor. The head-frame is to be extended higher, and a self-dumping skip installed. The ore, after it reaches the surface, is dumped into bins, chutes from which discharge it upon a steel conveyor by which it is fed into a 10 by 20-in. Blake crusher. The crushed ore drops into the boot of an elevator, whence it is raised to the top of the building, discharging into a trommel, the undersize from which passes through a hopper upon a belt conveyor which carries it to the shipping bins; the oversize discharges into a Crane spiral washer, set at 30°, the lower end being about half submerged in water. The ore, after being washed by this process, is discharged at the upper end of the spiral cylinder upon a sorting belt that moves at the rate of 20 ft. per min. The sorted ore is carried by the belt-conveyor to the shipping bins. F. M. Smith, widely known as 'Borax Smith,' is president of the West End company, which employs 50 men. The erection of a milling plant is being considered. The Tonopah-

Tonopah-Montana Mill.

Belmont Development Co., whose holdings comprise an area of 116 acres on Mt. Oddie and Rushton hill, is shipping to the Kennett smelter 1500 tons per month of ore that runs $75 per ton, and is treating 6000 tons per month in its mill at Millers; the mill ore is said to run $32 per ton. The ore carries, approximately, 1 oz. gold to every 100 oz. silver. The net earnings for the quarter ended August 31, 1910, were $503,477, and for six months ended that date were $677,676. Those responsible for Belmont operations and results are: Frederick L. Bradshaw, manager; J. F. Fitzgerald, general mine foreman; R. J. King, mining engineer; A. F. Jones, mill superintendent. Great interest now centres in the Belmont by reason of the discovery and development of the new vein which was first opened in December, 1909, by driving, from what is designated as winze 1056, on the 1100-ft. level. This development and discovery was east of the Belmont fault. The new vein, which has an east-west strike and a north dip, has been opened on its dip to a depth of 450 ft. There has been 700 ft. of driving in ore on the 1100-ft. level, and a considerable amount on the 900, 1000, and 1166-ft. levels. Winze 1056 serves as the avenue from which all development has proceeded on the new vein below the 1000-ft. level. It starts on the latter level and terminates at 1166, and inclines about 45°. An electric hoist at the top of the winze hauls ore in mine cars from levels 1100 and 1166 to the 1000-ft. level where they are trammed to the 1000-ft. station of the Desert Queen shaft, through which they are hoisted to the surface. The width of the new vein is 10 to 40 ft., the width of the ore ranging from 10 to 20 ft. In one place a lenticular body of andesite seems to have split the vein. This 'horse' is

of the ore body is as the vein walls consisting of the country rock in which the veins of the district occur. Also the Belmont property possesses several other veins which have the quality common to the ore of the Tonopah district, but the principal part of the mineralization is confined to the main vein, and the production is confined almost entirely to the vicinity of the shafts. The plan is to continue sinking the main shaft on the group is known as the Desert Queen which is 1300 ft. deep, levels from which penetrate all parts of the property. However by December 1 the centre of operations will be at the new Belmont shaft situated on the east side of Mt. Oddie 1200 ft. northeast from the Desert Queen shaft. The new shaft has been sunk to a depth of 1000 ft. and has three compartments each 4½ by 5 ft., two for hoisting and one for ladderway and pipes. It is well timbered and ready for use. The two shafts are connected on the 1000 and 1100 ft. levels. An A type steel head frame has been erected over the new shaft and the new shaft house compressor building, blacksmith shop, change and store rooms and transformer house, all of steel and concrete are under construction and nearly finished. A 300 hp. double drum electric hoist, Wellman Seaver Morgan make with Westinghouse motor, is being installed. A Nordberg electrically driven air compressor, capacity of 1800 cu. ft. of free air per minute, has already been installed. The ore bins are ready also the tracks leading to them from the collar of the shaft. The railroad track passes below the bin chutes. A modern office building, two stories high, is finished and ready for occupancy. It includes drafting room and vaults for valuable papers. The Belmont has 250 men on the payroll at the mine, and 45 at the mill. The MacNamara Mining Co., whose Tonopah holdings lie between the West End and Tonopah Extension groups, has shipped 8000 tons of ore to Coram, California, since March 1, and the average monthly shipment now is 1500 tons. The ore runs 85 to 90% silica, and samples about $25 per ton, one-third of the value being gold and two-thirds silver. Occasional shipments of selected ore had a gross value of $100 to $300 per ton. The 800 ft. shaft serves to open two veins on the property—the upper and the lower. The upper vein, on which the principal development has been done, has an east-west strike and an average dip north of only 20°. It lies between a hanging wall of earlier andesite and a footwall of rhyolite-dacite, and ranges in thickness from 4 to 8 ft. The gangue material is mainly quartz, and a highly silicified phase of wall rocks, being an incomplete silicification of them. The silver occurs mostly as argentite, the gold being associated with it. In many places the vein is absolutely flat, and in the flattened sections is found the richest ore. This vein has been opened by levels from the 200, 300, and 375-ft. stations. The lower vein has been partly developed by a level from the 800 ft. station. It has nearly the same strike and dip as the upper vein, but it has a rhyolite-dacite hanging wall and an andesite foot-wall containing much calcite. Its thickness is from 40 to 50 ft., the value of the ore being in gold and silver in nearly equal portions. It is probable that this vein will be opened by driving a cross-cut from the 600 ft. station. The cost of mining here is doubtless increased considerably by reason of the veins being so nearly flat, as little of the ore can be moved by gravity. In sorting the better grade of ore for shipment a large tonnage of mill ore has accumulated on the dump, and much of similar grade is left in the mine. Herbert Haas, who became manager of the property on June 1, states that a milling plant may be erected, though no definite plans for same have been made. With a mill to handle the low-grade ore it would be possible to mine and profitably handle all material between the walls. The property is controlled by California people, J. L. Joseph of San Francisco being president. The development proceeds at the rate of 400 ft. per month. The hoist is operated by compressed air, the Ingersoll-Rand compressor being driven by electric power. Fuel oil is used in sharpening and tempering drills, a Leyner sharpener being in use. A force of 35 to 40 men is employed. The Tonopah Extension is treating an average of 1.6 tons of ore per day in a concentrating and cyaniding plant, the ore carries $17.27 per ton. In connection of the mining there is a force of 50 men employed. For September the extraction of gold reached 94.4% that of silver 91.8%. The total extraction being 92.7%. For the same month the concentrate contained 4.8% of gold and 4.6% of silver per ton, the recovery by concentration amounting to 29% of the total. This mill was described in the *Mining and Scientific Press* April 9, 1910 by John C. Kitchen manager of the property. The principal change made in the process since then has been to apply the Underfeed method instead of the overfeed to the Pearl agitating tanks. The excellent mill work at this plant is under direction of J. P. Montague. The Midway mine under the management of W. J. Douglas has shipped 1400 tons of ore to Kennett, California, within the last six months, which sampled close to $35 per ton. The proportions of gold and silver in this ore are similar to those of the other mines of the district. A force of 35 to 40 men is employed special attention being paid to developing and exploring. The ore shipped was taken from the 200, 300, 400, and 500 ft. levels.

The Montana Tonopah, a resume of the operations and production of which was published in the *Mining and Scientific Press* of October 15, is running practically the same as reported at that date.

NEW YORK

Improved Market.—Ray Central Still Statue Quo.—Butte News.—Tennessee Copper's Costs Reduced.—Cobalt Output.

A change has come over the feeling of the market. A good strong upturn, general throughout the list, carrying prices to higher levels than reached for some months, with trading running close to one million shares daily has gone far toward re-establishing confidence. The public has long been impatient of waiting for the settlement of various things which have been controlling adverse market factors. The continued improvement in copper metal forms the most encouraging feature in the mining share market. The curtailment policy is voted a success. Copper sales are increasing in volume and 13c. copper is already at hand. Mine operators and mining companies engaged in developing or working Mexican properties are jubilant over the improved outlook for silver. The industrial development of China and the comparative prosperity of India have so far increased the demand for silver as to register a quotation considerably above any price of the last two years. The unexpected action of J. Parke Channing, in advising the rejection of the option on the Ray Central bond issue held by the General Development Co., has, for the time, killed trading in the issue. So far the General Development Co. has not acted on the recommendation. Some financing has been completed by the developing 'porphyries' and an era of construction may be expected during which markets will probably be somewhat inactive. Inspiration has been one of the features in the copper list, having scored a five-point advance with a greatly increased business. The corporation has recently sold all of its treasury stock, 202,292 shares, at par, $10 per share, and has retired all of the preferred stock, leaving the concern with 1,000,000 shares outstanding, a large cash reserve ample for all immediate uses, and without any debts beyond accruing payrolls. Work on the 5000-ton concentrator is to begin at once. Ray Con. has completed its financing, sufficiently to cover all needs for the concentrator, smelter, and power plant, by the authorization of a $3,000,000 bond issue, convertible into stock at $20, to be offered to the stockholders at par. The bonds have been underwritten and all that are not taken by the shareholders have been several times over subscribed. The new concentrator is expected to go into operation in February, 1911. The identity of ownership is so complete in the string of gigantic coppers controlled by the Guggenheims and headed by Utah Copper, that a consolidation has seemed almost inevitable, at least a merger to include Utah, Nevada Con., Ray Con., and Chino, and the two recent additions to this group, Inspiration and Mason Valley. The many conjectures in regard thereto have at length drawn a semi-

official statement from the Utah company to the effect that no merger is contemplated so long as the newer companies are still in the development stage. The Stock Exchange house of Hooley, Learnard & Co., has been prominent in the affairs of the Consolidated Arizona, which operates the smelter at Humboldt, Arizona. Changes are rumored in the directorate of this company, it is being said that W. A. Clark, J. R. Delamar, and H. C. Frick are to take places on the board. There may be some ground for the rumor so far as it concerns Clark, the Consolidated Arizona having a contract to treat part of the output of the United Verde mine. An examination is being made of the Live Oak ground at Globe, Arizona, in behalf of a Boston banking house, which is to undertake the financing of the company, if reports are satisfactory. The management claims to have proved up 10,000,000 tons of 2% copper ore by diamond-drilling. The announcement is definitely made that the new smelter of the International Smelting & Refining Co., at Tooele, Utah, is not to handle the Giroux ores, but that the latter is to be equipped with a smelter of its own and to make no attempt to begin extraction until the new smelter is ready to blow in. The new Alpha shaft of the Giroux is to be the main operating shaft of the property. The North Butte-Tuolumne controversy has been much discussed in the East the past few days. There has been strong buying in Tuolumne and an apparently authentic story that North Butte was bidding more than the market price for a controlling interest in Tuolumne. The East Butte is shipping 200 tons daily which runs better than 7 per cent.

The annual meeting of the Federal Mining & Smelting Co was held this week in New York. F. H. Brownell was re-elected president; Frank Sweeney and W. Clayton Miller, the general manager, were elected directors; succeeding Edwin Packard, vice-president, and Henry E. Cooper, retiring. The office of vice-president, is, for the present, left unfilled. Mr. Brownell said the company can pay dividends upon its preferred stock, future improvement depending upon the metal market and the result of further development and partly upon some new processes for extraction now being tested on ores of the Morning mine. The work on the Western group has been disappointing and after the expenditure of $250,000 has been almost wholly discontinued. Low metal prices last year were an adverse factor. The company has in its treasury Bunker Hill & Sullivan stock, which pays $100,800 in annual dividends. If the management decides to do extensive exploration work this fund will probably be used for that purpose.

The Tennessee Copper Co. is making a strong bid for a place in the front rank of low-cost copper producers. During the past two years the efforts of the management have been concentrated upon the perfecting of the company's sulphuric-acid plant, which is running at one-half capacity. Construction work has been completed, and the entire plant will be in operation within 90 days. The annual output is expected to reach a total of 200,000 tons and to show a net profit of $500,000; crediting this against copper costs will bring that figure down to 5c. per pound. The southern demand for sulphuric acid is increasing to such an extent that in all probability another unit will be added to the acid plant within the next two years, with a corresponding increase of copper production. The present copper output is 14,000,000 lb., but the mines can output an additional 10,000,000 lb. Tennessee is expected to resume dividends at the rate of $1.50 per share within the present year. At Cobalt a new vein has been opened parallel to the main La Rose vein, and the ore uncovered so far is estimated at $500,000. La Rose is selling for about $4.50 and not counting this recent find, is said to have about one-third of its market value in sight net. The annual report of the La Rose just issued, shows: ore shipped, 6,313,905 tons; silver recovered, 3,100,444 oz. which returned gross $1,620,341. The average price received for silver was 52.25c. per oz. Dividends paid during the year, $910,000. The suits which have been pending against the Crown Reserve of Cobalt, have been withdrawn. The Cobalt Central properties are to be sold under judicial decree by the liquidator. The sale is set for December 28.

The financial report of the Nipissing Mines Co., of October 1, shows assets of $1,344,601, consisting of cash in bank, $572,038; ore in transit and at the smelter, $315,141; ore sacked at the mine ready for shipment, $457,422.

Following the purchase of the Rea Mines, Ltd., of Porcupine, by the Consolidated Gold Fields Co., of South Africa, it is said that Barnato Brothers, of London, and J. & P. Coates Co., each have engineers in the camp examining properties. These interests, with the McArthur-Forrest people of Glasgow, make a formidable showing of British capital engaged in the development of the new Canadian goldfield.

MEXICO

Revival of Mining about Zacatecas. — El Bolanos to be Reopened. — Smelting on the West Coast.—Copala Mines Closed. — Railroad Earnings.

The foreign mining men of the Zacatecas district have organized an association, an important object of which is a revival of mining and milling in that old district, which for many years was one of the great sources of silver supply in Mexico. It is hoped to attract capital by making known the advantages and opportunities of that section and the results obtained by modern methods. The district has been dormant for a long period, but there is now promise of an awakening, and in this the organized encouragement of the foreign mining interests, as now proposed, should be an important factor. The Chapala Hydro-Electric & Irrigation Co., of Guadalajara, has plans for the transmission of power to the Zacatecas district, and with electrical power, delivered at comparatively low cost, the profitable working of old dumps and mine fillings, as well as the extensive development of old and new properties and the economical treatment of ores, will be possible. The Zacatecas Mining & Metallurgical Co., organized last year to operate the San Cristobal and Zacatecas groups, in the Zacatecas district, is completing a modern plant for concentration and cyanidation, and custom ore will be received. The 50-ton custom plant erected just outside Zacatecas, in which the State government has an interest, has not yet proved the success hoped for, and some remodeling may be done. The solution of metallurgical problems has been necessary, due to the varied character of the ore presented. The Zacatecas Syndicate, Ltd., representing the A. Goerz interests of London, has installed pumping equipment of greater capacity at the Rio Tinto, the former having proved inadequate to handle the water. The plans of this concern include important reduction facilities. A plant is being built to cyanide old tailing from the Laguna de Guadalupe, where there is a large accumulation. The Bote Mining Co. is successfully cyaniding its dump, and is rushing development in the mine. The San Roberto mine of C. A. Bentley, under development and shipping, will require a concentrating plant. Closely associated with the Zacatecas district in the days of great activity was the old Bolaños district in the northern portion of the State of Jalisco, and in that district also there is now promise of a mining and milling revival. The English syndicate that worked the Veta Grande at Zacatecas

Zacatecas, Mexico.

during the last century was operated the old Bolaños silver mines under lease and according to reports. Control of these mines, which are credited with a production in excess of $100,000,000, was recently obtained by the Bradbury interest of Los Angeles, Cal., owning the old Minas del Lago in the Rosario district of Sinaloa. Arrangements are being made to unwater the old workings and the extensive development of the properties. Pumping equipment has been ordered from the United States and the road from Zacatecas to the mines is being repaired. For several years the Bolaños mines were involved in litigation between Juan B. Iscoa, of Guadalajara, and the Bolaños Mining Co., of St. Louis, Mo., a Missouri concern organized to acquire the mines from Iscoa. Title to the mines were obtained by Iscoa from representatives of the Eagle Mountain Mining Co., an American concern formed in the '80s which also was involved in litigation and which accomplished very little. All the rights of the Bolaños company were purchased by the Bradbury interests and a merger effected with Iscoa. During the life of the St. Louis company practically nothing was done. The mines were flooded with the water of the Bolaños river which was turned into the workings to put out a fire, said to have been started by the manager of the English syndicate with the object of preventing an examination by the owners. This examination was planned with a view to proving that a demand for $500,000 yearly for a renewal of the lease was justified by conditions. The syndicate had been paying half that sum. The mines were then producing heavily. In the San Martin de Bolaños camp, twenty miles south of the old Bolaños mines, St. Paul men will unwater and develop the Zuloaga, an antigua, owned for the last three years by Patrick Fitzgerald. In the same camp the Rosario Mining Co., organized by Pennsylvania men several years ago to operate the Rosario, Condesa, and other old mines, is starting work. The recent purchase of the Guaymas lead smelter of the Mexican American Smelting & Refining Co. by the Pacific Smelting & Mining Co. is in line with the latter's plans for the establishment of an important custom smelting business on the west coast of Mexico. The plant will be overhauled and the facilities for the smelting of lead ores made complete. The Mexican-American Co. was a W. C. Greene enterprise, and the furnace was erected and blown in to hold a State concession for a smelter at Guaymas. After the provisions of the concession were complied with no smelting was done. The Pacific Smelting & Mining Co. through its Mexican operating concern, the Compañia Metalurgica y Refinadora del Pacifico, is actively in the market for lead and copper ores, the former for the Guaymas and the latter for the Fundición plant, and contracts are being made. Large reserves will be accumulated before the smelters are blown in. A copper-converting plant will be later installed at Fundición. All work has been stopped at the Copala mines of the Butters Copala Syndicate, in the State of Sinaloa, and G. A. Swanquist, who has been in charge, has left for the Butters properties in the Republic of Salvador. It is probable that work will not be resumed until capital for extensive development is available. Since milling was suspended last fall a limited amount of development has been in progress, and this work, it is said, has shown the existence of bodies of higher grade ore. The profitable operation of the mines depends on the opening of such orebodies, as the ore now available is too low grade for profitable treatment. When the mines were taken over by the Butters interests the market value of silver was much higher than at present. The Butters cyanide plant at the Copala mines is one of the most complete in the west coast section of Mexico, and has handled over 300 tons daily. Chas. Butters, head of the syndicate, is expected to visit the properties at an early date. The Palmilla Milling Co. will soon have the first unit of its 1000-ton cyanide plant in the Parral district ready for operation, the expectation being to place it in operation before the end of November. The mill will be able to handle from 300 to 400 tons per day. In anticipation of the early inauguration of milling, the Alvarado Consolidated Mines Co., which controls the Palmilla company, is putting the Palmilla mine in shape for production. This is the property that made Pedro Alvarado a former mine owner, a millionaire for a time, and the lavishness of the corporate Mexican resulted in many stories, some of them true but others without foundation. One of the most widely circulated had offers to pay the national debt of Mexico. In addition to operating Palmilla ore, the Palmilla company will do custom work. Another complete plant that will be soon in operation in Parral district is that of the Vela Colorada Mining & Smelting Co. This plant, which on account of company difficulties remained in an unfinished state for some time has been remodeled under the direction of Bernard MacDonald, of Guanajuato. It will handle 200 tons per day. The production of Parral district has shown an increase of late, the September output reaching close to 50,000 tons. The October output is expected to be over that amount. Two modern reduction plants will be soon added to the list of those operating in Guanajuato district. One is at the Tajo de Dolores mine of the Providencia Mining & Milling Co., and the other at the properties of the Tula Mining Co., at La Luz. The Providencia mill has 40 stamps, and the Tula 10. The report of operations of the National Railways of Mexico (Government merger system) for the fiscal year ended June 30, last, recently issued shows gross earnings of ₱52,562,293.39, and net earning of ₱20,968,735.61. The net earnings for the year were sufficient to leave a surplus after payment of all operating and interest charges. But 2% for three years was guaranteed under the merger on the $30,000,000 of first preferred stock. Prior to the recent annual meeting 3% had been paid, and at the meeting an additional 1%, a total of 4%, was authorized. The gross and net earnings for the first 3 months of the present fiscal year are largely in excess of those of corresponding months of the previous year, and a much better showing is expected for the 12 months. A large percentage of the merger revenue is derived from the transportation of ores, mill products, and mine and mill equipment.

BUTTE, MONTANA

Conditions at the Anaconda.—Important New Developments.— Pending Litigation.

While there has been considerable curtailment of copper production by the Anaconda and allied companies, there has not been a corresponding reduction of ore mined nor of the number of men employed in the Butte mines. There are certain fixed charges for mining operations that cannot be reduced, and a certain number of men must be kept at work with little regard to the amount of copper produced. Advantage is taken of the necessity in employing a large force to mine a lower grade of ore and to do more than the normal amount of development. The result is that since curtailment has been in force at Anaconda properties a large amount of new work has been done, and is under way. Reports are that several large new orebodies have been opened. It is claimed by some of the officers of the Anaconda that the mines have never been in better condition and have never been better prepared to respond to a heavy demand. Development of high-grade bodies of ore in the deep levels is reported from four or five important mines. The best of these new discoveries is in the West Colusa mine of the old Boston & Montana Co., which is worked through the Leonard shaft. On the 1400 and 1600-ft. levels a large and rich body of ore has been mined and a new level has been opened on the 1800, where the same body of ore has been found, though larger and fully as high in grade as above. The Red Metal company has extended the 1800-ft. level of the Minnie Healey mine to within 40 ft. of the large new body of ore in the West Colusa and is in the same orebody. A new level has also been opened at the 2200 of the Mountain Con. mine, one of the old Anaconda group. The vein is large and of high grade. In an interview, B. B. Thayer, of the Anaconda company, is quoted as saying that the mines are looking great, and are in condition to respond to any demand that may be made on them. Considerable new work is under way, including the installation of a large air-compressor plant, with which hoisting will be done at the High Ore mines.

General Mining News

ALASKA

KETCHIKAN DISTRICT

(Special Correspondence).—The Rush and Brown mine has been unwatered and is being operated under the management of U. S. Rush. The first shipment will be made early in November. The ore goes to the Tacoma smelter.

Ketchikan, October 15.

It is reported that practically every claim on Pedro creek, near Fairbanks, is under option to the agents of an English syndicate, the purpose being to dredge the ground next summer. The ground is shallow and suited to dredging.

The report of the Alaska United Gold Mining Co. for the month ended September 15, shows that the Ready Bullion mill (120 stamps), ran 30 days, 14 hr. 56 min. Water power 1 day, 18 hr. 7 min.; steam power 28 days, 20 hr. 49 min. 700 mill (100 stamps), ran 30 days, 17 hr. 42 min.; water power 1 day, 20 hr. 10 min.; steam power 28 days, 21 hr. 32 min. Tons ore crushed, Ready Bullion mill, 20,580; tons sulphides saved, 375; estimated gross value of free gold, $26,031.46; estimated gross value of sulphides, $18,072.56; total production (R. B. mill), $44,104.02; realizable value, $41,593.71; operating expense, $27,513.61; net operating profit, $14,080.10; construction expenses, $7015.60. Yield per ton $2.14. Development work, 421 ft.; assay value $0.97 to $2.42. Tons ore crushed 700 mill, 16,474; tons sulphides saved, 300; estimated gross value of free gold, $22,615.61; estimated gross value of sulphides, $16,648.83. Total production (700 mill), $39,264.44; realizable value, $37,238.29; operating expense, $26,585.86; net operating profit, $10,252.43; construction expense, $3721.92; yield per ton of ore milled, $2.38; development work 700-Foot claim, 231 ft.; assay value $1.14 to $3.93.

ARIZONA

GILA COUNTY

(Special Correspondence).—The total amount of work completed in driving, raising, and shaft work at the Miami mine is 75,000 ft. About 265 ft. is now being done weekly as the mine is ready for production with the exception of making a few connections between the orebody and the main haulage drifts.——Hoval A. Smith, president of the Live Oak Development Co., is visiting the property. It is estimated that the orebody as indicated by drill holes contains 10,000,000 tons of ore averaging from 2 to 25% copper. The orebody extends into the unexplored land belonging to the company 900 ft. west and 2000 ft. south of the drill holes.——Engineers in the employ of Hayden, Stone & Co. are about to make an examination of the Inspiration mine. Mr. Hayden of that firm, and Mr. Jackling of Ray Con. are expected to visit the property soon.——A cross-cut driven southwest from the McGaw shaft of the Superior & Boston mine on the eighth level has cut the Great Eastern vein and found that oxidized ore extends to that depth. Driving on the vein has been commenced in two directions. Assays of the ore are not yet obtainable. The McGaw shaft is 907 ft. deep and will be continued. The next level will be established 960 ft. from the collar. Frank H. Probert, consulting engineer, is visiting the mine.——Operations have been resumed on the eighth level of the Arizona-Colorado mine 3½ miles northeast of Globe. John F. Shaw is conducting operations and has recently developed a vein 3 ft. wide carrying ore averaging 4% copper and 30% iron. Test shipments will soon be made to the Old Dominion smelter.

Globe, October 21.

MOHAVE COUNTY

The old Mammoth mine is being reopened and excellent ore found, according to reports. The mill is situated over the mine workings and the ground is being inspected with a view to ascertaining whether or not the ground beneath has been stoped. If not, the mill will be repaired and will soon be in operation. If it is learned that it is insecure it will be moved to a new site. The Prosperity workings have drained the Golconda mine to the 300-ft. level, and the mill is running steadily. The Wallapai King mine in Todd basin is being reopened by A. H. Smith, superintendent for the Wallapai King Mining Co. Gardner & Goodrich have sold their Kokomo group of claims near the Tom Reed, to John Levizey of Leadville, Colorado. The prospect work shows a good grade of gold ore. Recently two men took from the stope on the 200-ft. level of the C. O. D. mine, at Stockton Hill, 17 sacks of ore running $2000 per ton gold. Owing to the heavy flow of water a drift is being run at the 280-ft. level, where good ore is being taken out of a recent discovery. Through this drift the water in the old works is being lowered, and when the 300-ft. level is reached it is thought the water from the old works will have been reduced to a minimum. When the mine has been opened and connection made with the 300-ft. level a large tonnage of ore will be available and shipments will be made. The mine is more than paying all expense of development.——At the power plant in Kingman the third unit is being constructed and will give the plant a capacity of 3000 hp. under ordinary pressure and nearly 6000 hp. under high pressure. The third unit is being built with a view to adding to it with a minimum of expense in the future. Twenty-five men are working on the plant and expect to have it completed in 60 days. The company is to run new lines to the mining camps in Union pass, making a loop from the Tom Reed through Silver creek, Barton's camp, Expansion, over the Union pass, and back to Kingman by way of Coyote hill. This will give the company a circuit of all the big mines of San Francisco district and enable the properties in the isolated sections to operate at a minimum cost of power. Within the year the lines will be carried to the north, where properties are being operated with gasoline generators. The sales of power will soon exceed 2000 hp. in the San Francisco district, and fully 1000 hp. can be sold in Wallapai district.

YAVAPAI COUNTY

(Special Correspondence).—F. L. Dwight, of Los Angeles, has taken an option on the Raible mine near the McCabe, in Chaparral district and will soon begin development. Two hoists are to be placed on the property. The Leland, Mount Elliott, Little Jessie, and Little Jack mines, all in this district, are in operation.

Prescott, October 21.

YUMA COUNTY

The Paycar mines near Bouse are shipping high-grade ore to the Humboldt smelter. The Arizota company has completed a road 20 miles from Bouse to the mine. Extensive development is to be undertaken. This property is owned in the Black Hills of South Dakota. Seth Bullock, formerly president of the Iron Hill Mining Co. of Deadwood, is largely interested. Mr. Bullock recently visited the mine. Seven miles east of Bouse the St. Valentine group is being prospected with encouraging results. It is expected the first shipments of ore will be made from the Tennessee group near Bouse before November 1.

CALIFORNIA

FRESNO COUNTY

The 10-stamp mill being built for the Davis Flat Mining Co., is nearly completed and it is expected that it will be running by Nov. 15.

INYO COUNTY

(Special Correspondence).—The report of Skidoo Mines Co. for September shows 1017 tons of ore milled; value of bullion produced $22,131.17; value of concentrate estimated at $500; total production $22,631.17; time lost in mill 6 days; cost of development $887.78; of operation $7687.67; total cost $8575.45; net profit for month $14,055.72.

Skidoo, October 22.

G. H. Bradford, of Tonopah, is building a 10-ton mill at Chrysopolis, near Sniders camp, to treat ore from the old Arastra property, on which he has a lease from Dr. Woodin and William Grant of Independence. The mill will also treat custom ore. Snider's property, and Loughrie's mine adjoin the mine leased by Bradford.

[illegible] COUNTY

The Kern River oilfield during the month of September produced [illegible] barrels of petroleum. There are four producing wells in the field, 15 wells are drilling and others are [illegible] ready to begin drilling.

PLACER COUNTY

The Bunker Hill mine, Excelsior, above Merced Falls, is said to be developed on a large gold drift that cuts the old river bed of the region, and is good-bearing throughout its entire width. Sackett prospecting by means of [illegible] Gravel, over 25 ft. has shown the gold impregnations to exceed the rock "pay" along the strike of the dike. Ventilation is being driven to reach the dike in depth. It is in the [illegible] and is estimated [illegible] about 150 ft. further to go to reach it, in all.

NEVADA COUNTY

(Special Correspondence.)—The Manti hoisting engine is to be removed shortly from the Central shaft to the Cincinnati Flat mine by the North Star Mines Co. Developments at the Cincinnati Flat are progressing vigorously with good results.—A more powerful engine will be installed at the Central shaft to take the place of the old machine. The 80 stamp mill is running largely on ore from Central workings.——It is rumored that a rich find was recently made at the Empire mine.——The Cassidy Con. company is arranging for the installation of heavier pumping machinery, the

Bridge Crossing South Yuba River, Nevada County, California.

present plant proving too small to handle the water. The shaft is down 240 ft. and has cut a vein of fair grade quartz. The water is greatly retarding work.——Driving for the channel at the Jenny Lind is progressing steadily, and it is expected to reach the objective point before winter sets in.——The rich ore shoot recently found in the lower workings of the Pennsylvania is showing up well.——The Brunswick is idle pending the arrival of the new pumps.—George W. Root, the manager, announces that work will be shortly resumed at the Kenosha mine, in the Deadman Flat section. Sufficient funds have been raised to continue development.——Rich ore is being extracted from the big vein at the Red Ledge mine, near Washington. The ore shoot is several inches wide, with the quartz rich in gold. Several specimens are on display in Nevada City and Grass Valley banks.——Payable gravel has been found in the Orient property, above Nigger Tent.——Because of lack of water for power, operations have been temporarily suspended at the Snowdon Hill mine. The adit is in 440 ft. and is expected to intersect the channel within 160 ft. As soon as sufficient water is obtainable the operation of the compressor and machine drills will be resumed. The washing plant has a capacity of 150 cu. yd. per day. Joseph B. Martin is manager.——The Alaska vein has been intersected 75 ft. in from the 750-ft. level. George St. John is manager.

Grass Valley, October 23.

James Accinelli, an Italian miner working in the Ancho mine, near Graniteville, drilled into a missed hole a few days since and was seriously injured.

SIERRA COUNTY

The Red Ledge mine at Scotts Valley is to be operated on a larger scale than at any time in the past. The ore is described as a great dike of ankerite with numerous [illegible] which occur [illegible] quartz veins, a large amount of rockwork. It is from 60 to 200 ft. wide. Developments consist of several adits driven on the strike of the vein.

TUOLUMNE COUNTY

(Special Correspondence.)—The Headlight plant is nearing completion.——The Adams Exploration Co.'s mill will be completed about November 1.——The Golden Eagle Mine & Development Co. is installing a cyanide mill on its Golden Eagle claim situated on the west fork of Copper creek.——The Stanton Syndicate, which now owns the Keating property on the north fork of Coffee creek, is installing a 2-stamp mill.——FitzHenry, Williams & Farnsworth have uncovered a 6-ft. vein on their North Star claim on the west end of Bill's peak. The ore is partly free milling.——Charles Crow has taken a lease on 10 acres of placer ground belonging to the Headlight company on Copper creek.——The New Blue Jay Co., owning the Blue Jay mine in Morrison gulch, has recently purchased the Morrison Gulch hydraulic mine, comprising three claims, and will get things in readiness for next winter's operations. The price paid is said to have been between $10,000 and $15,000.——It is reported that pitchblende has been found in the granite belt north of here.

Carlyville, October 20.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.)—Work was resumed last week on the Golden Glory adit on Saxon mountain. It is proposed to drive for at least 600 ft. additional. J. F. Puchart has been appointed manager.——Operations will be resumed on the Mineral Chief mine situated on Democrat mountain. During the past week men have been employed overhauling the machinery at the 50 ton concentrating plant, while a new cable is being strung to be used as a brake for the aerial tramway. H. E. Boothe is manager.——The Santiago sampler will be ready for operation within the next two weeks. The machinery has been installed. Work of placing the machinery for the concentrating department is under way.——It is reported that the sale of the Santiago mine to the North American M. & S. Co. is pending. During the past two weeks J. H. Robeson, consulting engineer for the latter, has been sampling the property. The deal is said to be for $500,000 cash.—Work has been resumed on the New York adit situated on Pendleton mountain.——Work was commenced two weeks ago on the Double Header adit on McClellan mountain. The property embraces 26 lode claims.—Parachine & Co., leasing on the Smuggler mine on Brown mountain, having been sending out steady shipments of high grade ore. A streak of smelting ore is exposed 10 in. wide, which averages 500 oz. silver per ton. The vein has been opened 175 ft.——The Hollingsworth M. Co., owning the Smuggler mine, is preparing for extensive development. The shaft, down 375 ft., is to be sunk 200 ft.——The Virginia City adit on Lincoln mountain within 80 ft. will intersect the Virginia City vein, at the 500-ft. level of the shaft workings.

Georgetown, October 24.

Lessees of the Smuggler mine, near Georgetown, are shipping regularly. It is said they are breaking 10 in. of ore which samples 50% lead and 500 oz. silver per ton. The streak has been opened by drift for nearly 200 ft. Stopes are being opened. Work has been resumed on the New York adit on Pendleton mountain, to develop veins lying between the Smuggler and the Gold Belt mines. The property is owned by the Smuggler, and the veins are supposed to be the extensions of the Smuggler. A lessee on one of the lodes of the group made a shipment recently that returned 262 oz. silver per ton and 43% lead. James Beshears of Bard Creek reports the discovery of another new vein near there. He is making an open-cut on the vein across the ridge, and has a 5-in. streak of quartz liberally

sprinkled with pyrite that carries $80 per ton in gold. There is a larger streak that carries $28 per ton. Bloch & Crist, who are working the Enterprise lode on Douglas mountain under bond and lease, have driven an adit of 90 ft. and taken out ore almost the entire distance. The streak is small but the ore is of good grade.

GILPIN COUNTY

(Special Correspondence).—The Banzai mine at Black Hawk is undergoing development. A shipment of two tons of first-class ore last week returned 13.12 oz. gold and 186.40 oz. silver per ton. Boellert & Co. are operating under lease.——The new concentrating plant on Gregory street which is being constructed to handle the dumps of the Bates Hunter mine, is nearing completion. W. S. Smith & Co. are the owners.

Central City, October 25.

It is reported that the cross-cut adit of the New Caribou mine has crossed 20 ft. of good ore. It carries gold, silver, and copper. Thus far this adit has cut 20 veins in a length of 1100 ft., but the last vein, above referred to, is the largest and best thus far. This adit is being driven 700 ft. below the old workings. The property is being re-opened by the Up-to-Date Mining Co. The Polar Star mill is crushing ore from the Gunnell mine, the ore coming out through the Newhouse tunnel. The old Kokomo mine is again being worked by local men who are themselves working in the mine. The shipments reach 80 tons monthly, mostly from the 500-ft. level. The ore runs from $20 to $30 per ton. At the Euclid mine in Black canyon, near the north line of the county, it is reported that ore assaying $16,000 per ton has been found by Henry Baer, superintendent.

TELLER COUNTY

David Daniels, timberman in the Portland mine, on Battle mountain, was struck by a falling rock, on the 22nd inst., and was instantly killed. He was at work on the 600-ft. level adjusting square sets when a slab of rock weighing about ten tons fell from the hanging wall. James Horan had his feet blown off, on the 21st inst., by a mysterious explosion in the ore-house of the Isabella mine near Cripple Creek. Although an investigation is being made it has not been learned how the accident occurred or whether or not it was the discharge of powder.

IDAHO

NEZ PERCE COUNTY

(Special Correspondence).—A complete reduction plant will be installed at the Anaconda mine, near Pierce. The machinery consists of a 7-ft. slow-speed mill with crusher and amalgamation system driven by water-power. The Anaconda has produced much ore in the last few years, and enough has been blocked out to justify the installation of the plant. A find of high-grade ore yielded more than 100 tons of rich ore, which will be the first to go through the new plant.

Spokane, October 20.

SHOSHONE COUNTY

(Special Correspondence).—A car of rich ore will go from the Golden Winnie mine near Murray in a few days. It is tungsten (scheelite) and is valued at $400 per ton. The Golden Winnie is an old gold mine. The development of its tungsten deposits is a new feature.——The Coeur d'Alene Nellie mine has been reopened. In the late eighties it was one of the richest mines of the district. The ore is gray copper running from 50 oz. silver upward. For years only assessment work has been done and the workings were allowed to cave. Ore is being mined through a new adit.——The Black Sand Dredging & Concentrating Co. is working over old placer diggings thirty miles from Orofino, Idaho.

Spokane, October 21.

NEVADA

ESMERALDA COUNTY

(Special Correspondence).—The Florence mill is treating 150 tons of ore daily, which runs $10 per ton. The extraction has averaged for some time 93%, of which 30 was by amalgamation, 33 by concentration, and 30 by cyanidation. The mill-feed comprises a mixture of oxidized and sulphide ore. The concentrate is sold to Benjamin Hall, who extracts the gold and silver by roasting and chlorination at the plant of the Goldfield Cl. Mill Co., which he has leased for three years. Since Mr. Hall obtained the lease of this plant he has removed some of the original equipment and installed a mechanical roaster of his own design, which is 72 ft. long, 10 ft. wide, and provided with mechanical rabbles. At the discharge-end of the roaster the material drops into a cylinder 40 ft. in length, which revolves at the rate of 2 r.p.m. While passing through this cylinder the ore is cooled and slightly moistened, discharging into an elevator that lifts it 12 ft., where it is thrown upon a screen to remove any scraps of iron or other foreign matter, and then into bins, and thence to chlorination tanks into which the gas is introduced at the bottom. The plant

Map of Nevada.

handles 15 tons per day of concentrate, but would exceed this if crude ore were treated. F. C. Beedle is in charge of the plant. Mr. Hall is well known as having for many years been identified with similar work at Nevada City, California.

Goldfield, October 22.

(Special Correspondence).—The plant of the Nevada-Goldfield Reduction Co., operating under lease to the Goldfield Combination Fraction Mining Co., is receiving and treating 65 to 70 tons of ore per day from the Fraction mine, making an extraction of 92 to 93% by amalgamation, concentration, and cyanidation. The crushing is by stamps, the amalgamation being done on plates, and the concentration on Wilfley tables. The cyanide treatment is by the all-slime method in agitating tanks, followed by filtration of the slime in Butters filters, and precipitation of the gold in zinc boxes. The pulp passes direct from the plates to the tables on which about two tons of concentrate per day is made; all the table tailing and middling goes to a Frenier pump by which the stuff is raised to an Aikens classifier whereby the sand and slime are separated. The slime flows from this classifier to slime settlers, the sand passing to a tube-mill, the pulverized product of which also flows to the slime

settlers. Of the ore, 95% will pass 200-mesh and 65% of it will pass 325. It is transferred from the settlers to treatment tanks having mechanical agitators. It is transferred again from the agitating tanks to stock tanks and thence to Butters filters at 45 tons. C. D. Wetmore is manager for the company, F. W. Lockman mill superintendent, D. R. Fitzsimmons mill foreman. Mr. Lockman states that the assay value of the final mill tailing for July was 24c. for August 23c. for September 22c. The shaft at the Florence mine, which originally had one hoisting compartment and manway, worked to the last three months has been enlarged to three compartments; this was effected by raising from the 500-ft. station to the surface. Then the same shaft was sunk between the 500 and 600 by cutting the station pockets, room obtained by driving from the 600-ft. station of the old Engineer's shaft. Each compartment is now 5½ x 5½ ft. clear; the shaft is timbered with 10 by 10-in. sets and lagged with 2 by 12-in. planks. Two new 2½-ton skips are in each hoisting compartment, which are being installed will work in balance. The skips were designed by Willis Lawrence, mine superintendent. They will dump automatically. Above each skip is a platform on which 10 men can stand and above this is the usual protecting hood. Considerable ore from the Florence is being taken from the stopes above the 150-ft. level on the Engineer's vein. Recent work has tapped the Riley orebody on the 350-ft. level, stopes being carried up from this depth. One section of this orebody had a width of 50 ft. It is said it will average 15 ft. in width for a length of 150 ft. Stopes on the 200-ft. level of this vein are yielding a good tonnage of ore. In the course of development in Florence ground many lenses and irregular bodies of ore are found, demonstrating the erratic character of the ore occurrences.

Goldfield, October 24.

LANDER COUNTY

The True Blue tunnel in New York canyon has been equipped with a compressor of 600 cu. ft. capacity. It is driven by a 75-hp. gasoline motor. The compressor plant is situated opposite the portal of the adit. In driving the adit 12-lb. T rail was used. This has been replaced by 16-lb. rail. Among other new equipment are 15 steel ore-cars of 20 cu. ft. capacity. Three shifts are working in the face driving the adit toward the Patriot mine, which will be reached 3650 ft. from the mouth. The adit is being run on the Patriot-Chase vein, which is already credited with a production of $5,000,000. The mines producing this were the Patriot, Morrison-Cable, Chase, Annie, and True Blue. These are now owned or controlled by the Maricopa company. It is claimed that the dike which forms the foot-wall of the vein carries from $3 to $40 per ton gold. The dike is from 80 to 100 ft. in width, and many samples taken from it show the presence of gold in varying amounts. A mill of 100 tons capacity was recently bought at Denver, which will soon be erected. The metallurgical process to be employed is a modification of the practice at the Tonopah mill at Millers.

NYE COUNTY

(Special Correspondence).—The Volcano group of claims, 16 miles northeast from Tonopah, is under bond to George Wingfield, who has a small force at work developing. Some ore is being sacked. W. B. Morris is in charge.——The Round Mountain Mining Co. is mining and milling 3000 tons of ore per month, and recovering on amalgamating plates from $35,000 to $40,000 per month in bullion.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence).—The Ernestine Mining Co. has the pipe-line completed, with water flowing into the mill by gravity. On Oct. 15 the plant started, dropping 30 stamps; work is in full force in both mine and mill. The eleventh level east has developed some rich ore; work is being pushed in 17 west.——The Treasurer Mining & Reduction Co. has let a contract for hauling 50 tons per day from the mines to the mill on Whitewater creek. A crew is erecting a transmission line from power-plant to the mines. Two shifts are at work in the mine, timbering and preparing for ore extraction. At the Deadwood mines the shaft has been connected to the 100-ft. level and ore is coming. Mill construction is progressing rapidly, with daily arrivals of machinery and supplies. Work has been started on a pipeline two miles in length, to convey water for milling and domestic purposes. Three cottages are also being erected.——At the Socorro mine coal mining started sinking the 4-compartment vertical shaft below the 600-ft. point on Oct. 14. This is the most important work in the district in progress at present.——On the 400-ft. level of the Enterprise mine a cross-cut is being run into the foot-wall dike and the Perseverance shaft is being retimbered.——High-grade ore was discovered in performing the annual assessment on the McKinley mine.——A cross-cut driven east from the main level on the Leap Year encountered the Malachite vein carrying good ore. The east drift on the Little Charlie continues in excellent ore. The three hoists at the Cooney mine are in shape for use. Grading for the new assay laboratory has been started.

Magdalena, October 24.

TEXAS

(Special Correspondence).—There is more prospecting and development going on in the Shafter silver mining district of Presidio county than for many years. It is stated that good ore is being found in some of the claims. The Silver Hill Mill & Mining Co., which was recently organized, has taken over a section of mineral land that was formerly operated by the Cibolo Mining Co. It adjoins the rich mine of the latter company at Shafter. The mine that the Silver Hill Mill & Mining Co. has acquired has a good producing record, its ore in the past having been treated at the Cibolo Mining Co.'s mill. It is announced that the new company will install modern machinery and begin an extensive system of development. The company has its headquarters at Marfa, which is the nearest railroad point to the mine, being 48 miles distant. It is reported that the construction of a railroad from either Marfa or Alpine to the Shafter mineral district is under consideration by those who are interested in mines in that district.

Alpine, October 22.

WASHINGTON

FERRY COUNTY

(Special Correspondence).—Stockholders of the Republic Mines Corporation received a dividend of $15,000 October 15. This brings the dividends up to $70,000 from a corporation ranking among the youngest in the State of Washington. The source of this profit is a vein from 3 to 15 ft. wide in the Lone Pine-Surprise mine in Republic district. Sixty cars of ore were taken out of this body during the month. Assays run from $15 to $150 gold per ton. While operations have been confined to a depth of 150 ft., an adit has been started that will open the shoot at 400 feet.

Spokane, October 20.

KITTITAS COUNTY

(Special Correspondence).—Directors of the Glacier Peak Mining Co., of Roslyn, Washington, are reported to have declined an offer of $500,000 for its copper mine in Lake Chelan district, northwest of Spokane. It is said that the offer came from the Guggenheims, representatives of whom examined the property following the report of an important discovery. Officials say that a large reduction plant will be installed, the ore being rich enough to insure profit from the start. The company is composed of ten residents of Roslyn, who have expended a large amount of money in development during the last two years.

Spokane, October 20.

CANADA

BRITISH COLUMBIA

(Special Correspondence).—An option has been given on the Vancouver group, Sheep Creek, to C. H. Harvey, of Nelson, who will interest Spokane capital in the property and do work. A tunnel has been driven 70 ft. on the vein and three cars of ore shipped with gratifying results.——The Wilcox mine at Ymir is getting out a car of concentrate to be shipped to the Trail smelter. The compressor for the Dundee mine is being installed. Part of the 5-stamp

mill for the Joker property near Kaslo is being erected. The concentrator at the Cork mine is running steadily. It is expected that the Rambler-Cariboo will be shipping again in a couple of weeks by way of Three Forks. There is a rumor, however, that the Government at Victoria has arranged with the Great Northern for the rebuilding of the Kaslo & Sandon railway.——The shipments of ore and concentrate from the Slocan-Kootenay mining district for the week ended October 15 and for the year to that date were as follows:

Mine.	Week, tons.	Year, tons.
Highland (concentrate)	71	241
Molly Hughes	34	326
Richmond Eureka	59	3,371
St. Eugene (concentrate)	150	11,826
Sullivan	838	15,962
Yankee Girl	85	4,251
District milling operations	4,000	205,400

(Special Correspondence).—While shipments from the mines of the Granby Con. M. S. & P. Co. have been light during the past few weeks, it is now announced by Mr. Graves, the manager, that hereafter the smelter will be run at full capacity, which will mean shipments from the mines of 18,000 to 28,000 tons per week. The company is considering the development of a water power it owns on Kettle river.——The working force at the Mother Lode mine of the B. C. Copper Co. is to be augmented and the output raised to 1500 tons per day. The second enlarged furnace is in operation at the Greenwood smelter. The profits of the British Columbia Copper Co. for August amounted to $34,625. The cost of producing copper was 7.7c. per pound. Mr. McIntosh, the manager, has returned from Chicago and reports that work will be resumed on the Greenwood-Phoenix tunnel with 20 men.——The shaft of the Midway coal property, owing to water trouble, is not being worked at present. A cross-cut is being driven on the seam. Work is progressing on the Combination property. The shaft is down 100 ft. A cross-cut is to be run to the ore-shoot, 30 ft. distant.—— The shipments of ore from Boundary district for the week ended October 15 and for the year to that date were:

Mine.	Week, tons.	Year, tons.
Granby mines	13,646	892,339
Jackpot	329	10,193
Mother Lode	9,503	283,758
No. 7	31	104
Rawhide	2,800	6,700
Snowshoe	2,131	125,093

Phoenix, October 21.

With the success of the Mayflower and Blue Bird mines this season the owners of the Hill Top property in the South Belt have been encouraged to begin a thorough system of prospecting their property. This is to be undertaken promptly, and will likely be followed by active development, as the Hill Top property has the Mayflower vein.——The report of the Dominion lead-bounty commissioner shows that an increase has been made in shipments of lead to the Trail smelter and refinery for the month of September over previous months. The following table gives the month's production:

Mine.	Weight ore, lb.	Lead, lb.
Blue Bird (Rossland)	48,667	2,095
Bismark	34,623	1,731
Emerald	344,484	122,326
Enterprise	46,165	15,142
Eastmount	135,668	18,092
Ferguson	56,769	11,524
Fidelity	663	263
Hewitt	42,985	3,095
Highland	132,061	79,498
Idaho-Alamo	142,234	39,056
Molly Hughes	63,556	572
Noonday	29,497	9,999
Mayflower	38,081	990
Ruth	140,893	80,393
Standard	399,072	283,460
Slocan Star	172,890	56,114
Yankee Girl	744,825	19,839
Van Roi	211,395	125,995
Widdowson	2,348	89
Richmond-Eureka	626,147	96,991
Sullivan	7,251,890	1,352,586
St. Eugene	1,183,394	716,034
Total	11,848,307	3,035,884

Nelson, October 22.

(Special Correspondence).—The ore shipments from Rossland district for the week ended October 15 and for the year to date were as follows:

Mine.	Week, tons.	Year, tons.
Centre Star group	3,730	147,357
Le Roi No. 2, Ltd.	557	23,768
Nickle Plate	67	617

Rossland, October 21.

ONTARIO

(Special Correspondence).—Frank C. Armstrong has returned to New York after an inspection of the Porcupine district and an examination of the Armstrong-McGibbon properties. On this group in North Tisdale the main vein has been shown at various places for a distance of 630 ft. At the eastern end a shaft has been sunk 14 ft. At the bottom of the shaft gold shows in five places. West of this 140 ft. a test pit sunk on the vein shows much gold, and 496 ft. to the west of the test pit an area 20 by 60 ft. also shows free gold. Mr. Armstrong has given instructions to strip the vein the entire distance and to sink two shafts, one at the eastern end and one at the western end of the outcrop. Camp buildings are being constructed and roads built to the property.——H. C. Collins, of the Porcupine Gold Ridge Mines Co., left Haileybury on October 15 to inspect work which has been done on the properties of his company in Porcupine. Reports at the New York office of this company state that two new veins have been found on the south end of the property near the north shore of Gillies lake. These veins are both well defined and assay $48.50 and $56 respectively, the samples being taken with care across the vein. On vein No. 1, assays as high as $320 per ton have been taken from rock showing no visible gold. The main shaft has reached a depth of 50 ft. where a cross-cut has been started to the vein. Stringers have already been cut in this cross-cut which show gold. It is said machinery will be brought in this winter and that the working force will be increased as soon as supplies can be obtained at reasonable cost.

Porcupine, October 17.

MEXICO

SONORA

L. R. Budrow, superintendent of the El Tigre mine, says that construction work on the new plant at the El Tigre is progressing and that between 500 and 600 men are employed in the mines, mill, and on construction work. All the foundations and cement work for the additional buildings and machinery have been done and considerable machinery has arrived. It is expected that by May 1, 1911, the new plant will be ready to put into operation, driven by electric power which is to be transmitted from the Copper Queen smelter at Douglas, Arizona.

CHIHUAHUA

The September report of the Rio Plata Mining Co. shows net returns on shipments $50,463.07 U. S. currency; mill crushed 1934 dry tons ore, containing 80,769 oz. silver gross; produced 21.2 tons concentrate; cyanide plant treated 2086 tons tailing containing 74,460 oz. silver gross; recovered in concentrate 21,721 oz. silver; recovered in bullion by cyanide 62,121 oz. silver; total silver recovered 83,842 oz.; value of silver recovered $43,300.51 U. S. currency; profit on store $281.10; total income $43,581.61; operating expense $16,062.57; operating profit $27,519.04.

Recent Publications

Alaska Mineral Production. By Earl Chamberlain. Proceedings of the Colorado Scientific Society. Pp. 11. Illustrated.

Concrete Water Conduits. Machinery Catalogue. By C. H. Norton. Pamphlet. Pp. 23. Illustrated.

Mineral Statistics of Perak for the year 1909. By C. P. Dickenson, Government Printer, Perak. No. 28 of the Department of Mines (Malay States).

Mineral Operations in the Province of Quebec for the year 1909. By T. C. Denis, Superintendent of Mines. A bulletin of the Department of Colonization, Mines and Fisheries. Pp. 92. Illustrated.

Progress of the Mineral Industry of Tasmania, being the report of the Secretary of Mines for the year ended June 30, 1910. This publication of 16 pages is statistical and gives much information in condensed form.

Outline Introduction to the Mineral Resources of Tennessee. By George H. Ashley, being an advance chapter of Bulletin No. 2 on the Mineral Resources of Tennessee. Issued by the State Geological Survey of Tennessee.

Informes y Memorias del Instituto Mexicano de Minas y Metalurgia. (Transactions of the Mexican Institute of Mines and Metallurgy) for June, 1910. By E. Girault. This deals chiefly with the San Rafael y Anexas, at Pachuca.

Forest Fires in North Carolina, being Paper No. 19, of the North Carolina Geological and Economic Survey. By J. S. Holmes, Forester. Pp. 52. Ill. This bulletin gives some valuable information concerning forest fires and means for their control.

Some Ore Deposits in Maine and the Milan Mine, New Hampshire. By W. H. Emmons. Bull. 432, U. S. Geol. Surv. Pp. 60. Index, maps, and sketches. Gives a description of the mineral deposits and their exploitation in the region indicated by the title.

Geological Map of Cobalt. By W. G. Miller and C. W. Knight. The Ontario Bureau of Mines has recently issued the fourth edition of the geological map of Cobalt, Ontario, on a larger scale than the earlier editions. The map includes some areas not formerly appearing on any map.

Estadistica Minera de Chile, en 1908-1909. By Guillermo Yunge. Pp. 696, Ill. Santiago, 1910. This volume is issued by the Sociedad Nacional de Minera, and contains a vast amount of information relative to the mining industry of Chile, including descriptions of the mines of gold, copper, iron, and the various deposits of nitre and other mineral salts of commercial value. Besides the above there are extensive chapters on the metallurgy of the various metallic minerals, as practised in that country. The figures of production given in this volume were summarized in the Mining and Scientific Press, May 28 last.

Twenty-Eighth Annual Coal Report of the Illinois Bureau of Statistics for 1909. By David Ross, secretary. Pp. 487. Springfield, 1910. This volume is Mr. Ross' usual complete exposition of the coal-mining industry in the State of Illinois, and treats the subject in great detail, with much statistical information relative to tonnage output, number of men employed, mining and haulage methods, relations of coal-mining industry to railroads, and much other valuable information. The total output for the year is given at 49,193,710 tons; the total number of mines, 886; shipping mines, 384; the latter produced 47,968,562 tons with an average working time of 189 days and an average value of all grades of ore at the mine of $1.012 per ton.

Book Reviews

Any of the books noticed in this column, or other books, may be procured from the Mining and Scientific Press.

Kent's Mechanical Engineers' Pocket Book. 8th edition. $5. John Wiley & Sons, New York.

The new volume has been completely revised and brought up to date. It contains over 100 new pages, several new tables to accommodate the new engineering data. The entire work has been reset, the tables revised, and the volume improved in many ways.

Sewage Disposal. By Leonard P. Kinnicutt, C. E., A. Winslow and R. Winthrop Pratt. Pp. 426. Ill. $3. John Wiley & Sons, New York; Chapman & Hall, London.

This book discusses fully the fundamental principles of chemistry and bacteriology involved, as well as the engineering features incidental to sewage disposal. It will be very useful to the student who has taken up this important branch of engineering and also to those officials who are identified with the health department of cities.

Economic Geology, with special reference to the United States. (Third edition.) By Heinrich Ries, professor of Economic Geology at Cornell University. Pp. 589. Maps and Ill. $3.50. The Macmillan Co., New York.

The work has been completely revised and enlarged. It deals with almost every phase of economic deposits in the United States, with a great many beautiful and instructive illustrations. The fact that this is the third edition of this work within four years is an indication of its value and popularity.

Mines of Africa. (Seventh edition.) By R. R. Mahson. Pp. 775. Maps. $6. The Statist, 51 Cannon street, London, E. C.

This annual publication formerly issued under the title 'Mines of the Rand,' now has been compiled to include the mines throughout Africa, its purpose being to give information, taken from official reports and other reliable data, relative to mines throughout Africa. The new volume, 1910-11 adds particulars regarding mines of the West Coast and of Rhodesia. The maps are a feature of the book.

Elementary Crystallography. By W. S. Bayley. Pp. 241. Index. Ill. $2. McGraw-Hill Book Co., 239 W. 39th street, New York.

This volume has been prepared in view of the increasing interest in the science of crystallography, in connection with the study of mineralogy. The author in his endeavor to supply something which would be of value to the student of crystallography—simplifying the science as far as possible—has succeeded admirably. The subject is presented in an attractive manner and the illustrations are particularly good. It is a work every student of mineralogy should own.

The Prospector

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

W. L. B., Gage, New Mexico: Diabase.

E. L. B., Carville, California: Yellow garnet.

J. S. H., Quincy, California: Quartz with brown garnet.

P. E. M. Co., Johnsville, California: Quartzite with soft serpentinized matter.

F. W., Conejo Blanco, Mexico: No. 1, Orthoclase porphyry; No. 2, andesite dike rock; No. 3, altered volcanic rock; No. 4, contact phase of an andesite or orthoclase porphyry.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

OPTION FOR PURCHASE OF MINING PROPERTY—ESTOPPEL

A land owner giving a written option for the purchase of mining property, and which recited a sufficient consideration, was estopped to deny the receipt of such consideration as against one who with his knowledge and without objection on his part purchased such option and paid substantial consideration therefor.

Horgendorn *v.* Daniel, 178 Fed. 765, May '10.

STATE REQUIREMENTS AS TO LOCATION OF PLACER CLAIMS

The statute of Colorado requiring the discoverer of a placer claim in order to complete his location, to post thereon a notice containing the names of the locators, and to mark the surface boundaries with substantial posts sunk in the ground at each angle of the claim, requires a locator to sink posts into the ground whether the location be on unsurveyed government land or on surveyed lands. And such requirement does not conflict with the United States statute providing that where placer claims are on surveyed lands and conform to legal subdivisions no further survey or plat shall be required, as this provision refers only to the plat and survey required to be filed on applications for patents and has no reference to location.

Saxton *v.* Perry, (Colo.) 107 Pac. 281. Feb. '10.

APPROPRIATION OF MINERAL LAND FOR RIGHT OF WAY—DAMAGES

Where a railroad company proceeded to condemn a right of way for its road over a large tract of land containing a valuable vein of coal, and where such right of way was along the base of the hills and which separated the hills containing the vein of coal from the only level portion of the land, available for the erection of a proposed plant to conduct mining operations, including tipples, shafts, side tracks, etc., the land owner was entitled to prove, as part of his damages, the lessened value of the level tract by reason of its being severed from the hill portion by the road, and that the entire tract must be considered as coal land.

Patterson *v.* Iaeger & Southern Ry. Co., 178 Fed. 649, April '10.

ACTION TO DETERMINE RIGHT TO PUBLIC MINING LANDS—IMPROVEMENT WORK

In an action to quiet title to mining claims an instruction was correct which informed the jury that if the requisite work was done upon one claim, the title to which was not in issue, and such work was done in pursuance of a system that tended to a development of the claims owned or claimed by the plaintiff in action, such work was sufficient to prevent a forfeiture of any such claims, where it was shown that the claim on which the work was done was an adjoining claim, and the law is that work done upon any one of such claims can be applied to any of the others. An instruction was correct which also informed the jury that work outside the limits of a claim must be such as has a tendency to benefit or develop the claim and that the burden of proof was upon the defendant to show that the necessary work was not done as required by law, but that the burden was upon the plaintiff to show that any work done outside of the claim must be for the benefit or for the development of the claim. In such an action the law requires clear, convincing evidence to effect the forfeiture of a claim duly located and worked in good faith, and the evidence must satisfy a jury by a clear preponderance thereto that the plaintiff failed to perform the necessary work before a forfeiture will be permitted. So whether work done on a mining claim is such as to benefit or develop other claims and so satisfy the requirement of the law as to development of such claims is a question of fact.

Big Three Mining & Milling Co. *v.* Hamilton, (Cal.) 107 Pac., 301. Jan., '10.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

HENRY HANSON is in San Francisco.

E. B. KIRBY is in British Columbia.

FRED T. WILLIAMS is at Coalville, Utah.

F. W. DEWOLF was at Pittsburg last week.

W. H. WILEY has gone to Peru for three months.

GEORGE H. DERN was in San Francisco this week.

E. H. BENJAMIN has gone to Hayden Hill, California.

C. J. HUTCHINSON has gone to Eldorado county, California.

T. LANE CARTER is in Mexico making mine examinations.

J. E. SPURR recently spent some time at Tonopah, Nevada.

ROSS B. HOFFMAN has gone to Montana to examine mining properties.

W. E. THORNE has returned to San Francisco from Dawson, Yukon Territory.

H. ABBOTT TITCOMB is at Newton, Massachusetts. He will return to London soon.

J. H. BAKER and R. B. HEGARDT have returned to Oakland, California, from Mexico.

VICTOR E. TOLL, of Seattle, is at the Palace Hotel in San Francisco for the winter.

ARTHUR L. PEARSE has gone to Juneau, Alaska. He will be in San Francisco November 12.

W. M. KNOX is in London returning from Brazil. He will reach San Francisco about December 1.

R. H. TOLL, of Denver, was in Kansas City last week and has gone to Arizona on examination work.

ARTHUR K. ADAMS has left Cheyenne, Wyoming, and is now at the General Land Office, Helena, Montana.

BERNARD BRUHN was in San Francisco this week on his way home to Honolulu from Plumas county, California.

EMERSON GEE has been examining mining properties at Chloride, Arizona. He returned to Los Angeles October 25.

DONALD FERGUSON, of Goldfield, Nevada, spent several weeks in Sinaloa and Sonora, Mexico, on mine examinations.

W. G. ANDERSON, recently with the Cia. Minera La Republica Suaz, Chihuahua, Mexico, is now at 220 Parnassus avenue, San Francisco.

E. S. BASTIN and J. M. HILL have left Central City, Colorado, for Washington, D. C., having completed their season's studies of the geology of Gilpin county.

COREY C. BRAYTON has taken a position as superintendent of the rock-crushing department for the Natomas Consolidated. He will make headquarters at Sacramento.

Among the members of the American Institute of Mining Engineers sailing from New York October 21 for the Canal Zone were: D. W. BRUNTON, R. W. RAYMOND, J. W. AILES, THOMAS BROWN, F. L. CLERC, H. S. DRINKER, C. W. GOODALE, H. W. HARDINGE, HENNEN JENNINGS, WILLIAM KELLY, WILLIAM KENT, CHARLES KIRCHHOFF, W. A. LATHROP, A. F. LUCAS, R. V. NORRIS, E. W. PARKER, H. C. PERKINS, J. W. RICHARDS, D. M. RIORDAN, D. B. RUSHMORE, W. L. SAUNDERS, J. M. SHERRARD, JOSEPH STRUTHERS, A. E. VAUGHAN, DAVID WILLIAMS, GARDNER F. WILLIAMS, and THOMAS D. WOOD.

A TRANSLATOR with a knowledge of German, French, and Spanish, is wanted by the U. S. Bureau of Mines. Applicants should send to the U. S. Civil Service Commission, Washington, D. C., for Forms 752 and 1312.

JUNIOR ENGINEERS are wanted by the U. S. Bureau of Mines and an examination will be held by the U. S. Civil Service Commission November 22-23, to form an eligible list. Candidates should apply to the Commission at Washington, D. C., asking for Forms 757 and 1312.

Company Reports

TEWKSBURY AMAL. GOLD DREDGING CO.

Two contractors' reports of the Tewksbury Amalgamated Gold Dredging Co. of Australia afford some interesting data on the cost of dredging in that region. The Tewksbury property is situated in northeastern Victoria along the Ovens and Buckland rivers near the village of Bright. The company commenced five dredges in co-operation during the first six months of 1908, and the first half-yearly report of H. S. Love, the engineer, shows that these five machines during six months dredged an area of 42 acres, moving 1,056,051 cu. yd. of gravel, recovering 4395 oz. 19 dwt. of gold which was sold for £17,817 5s. 7d., an average of 4.049d. per cu. yd. The working costs during the same period were as follows: 1.714d. (1.428d.) per cu. yd., a remarkably low cost for dredges of such relatively small capacity, the average daily cardage for the five dredges being only about 1600, which is about one-half the capacity of the larger type of dredges of California. The depth of gravel in the various pits ranged from 13 to 21.3 ft. Individually the dredges vary in capacity during the period mentioned from 48.2 to 71.2 cu. yd. per hour.

During the half year ended June 30, 1909, the performance of these five dredges was somewhat less satisfactory, the acreage being larger and the number of cubic yards being 1,181,609, as against 1,056,051 in the first half of 1908. The gold yield in the first half of 1909, however, was but 3341.3 oz., as compared with 4395 oz. 19 dwt. for a similar period in 1908, while the working costs were increased from 1.714d. per yard in 1908 to 1.758d. (about 3.51c.) in 1909. The real cause of this increase in cost of operation is not apparent from a study of the figures of the report, further than that there was an increase in expense in nearly every department, though the increase in cost is particularly noticeable in the item of renewals and repairs to dredges during the later period, which was to have been expected. The dredges at Bright are of the ordinary open-connected type, and the work was done on alluvial flats under favorable conditions.

The following table gives the costs of dredging operations at the Tewksbury company's property for the two periods mentioned:

	Total, 1908.	Average per dredge.	Total, 1909.	Average per dredge.
Time worked, hours	16,476	3295	16,551	3310
Area dredged, acres	42	8.4	47.49	9.5
Average depth, ft.	16	....	15.4	....
Turnover, cu. yd.	1,056,051	211,210	1,181,609	236,322
Turnover, per hour	....	....	71.4	....
Gold won	4395 oz. 19 dwt.	879 oz. 4 dwt.	3341.3	668.3
Gold won, per acre	104 oz.	....	70.4	....
Gold won, per week	169 oz.	33.8 oz.	132.3	26.4
Gold won, value	£17,817 5 7	£3563 9 1	£13,521 1 0	£2704 4 10
Gold won, value per cu. yd.	4.049d.	....	2.746d.	....
COSTS				
Wages and salaries	£4404 8 4	£880 17 8	£4694 3 8	£938 16 9
Wages and salaries, cost per cu. yd.	1.001d.	....	0.954d.	....
Repairs and renewals	£855 13 10	£171 2 9	£1413 1 3	£282 12 3
Repairs and renewals, cost per cu. yd.	0.194d.	....	0.287d.	....
Firewood	3088 cords	617 cords	3657	731
Firewood, per week	118.9 cords	23.7 cords	140	28
Firewood, cost	£1533 8 3	£306 13 8	£1775 10 10	£355 2 2
Firewood, cost per cu. yd.	0.348d.	....	0.360d.	....
Other costs	£646 14 10	£129 7 0	£774 0 1	£154 16 0
Other costs, per cu. yd.	0.147d.	....	0.157d.	....
Total working costs	£7540 5 3	£1508 1 1	£8656 15 10	£1731 7 2
Total working costs, per cu. yd.	1.714d.	....	1.758d.	....
Total working costs, per oz. of gold	£1 14 4.2	....	£2 11 9.8	....

A comparison of costs of dredging must necessarily be unsatisfactory unless every condition in each instance is known. W. H. Shockley supplied figures on the cost of dredging in Siberia, in which he stated that in the Urals the cost per cubic yard was from 6 to 8c. and on the Yenisei it ranged from 8.5 to 11.5c. per cu. yd. In California at one property near Oroville the average cost in dredging loose gravel with a bucket of 1½ cu. ft. capacity during a period of six years averaged 1.94c. per cu. yd., and another dredge operating in tight gravel with buckets of 2 cu. ft. capacity during four years did the work at a cost of 2.94c. per cubic yard.

BROKEN HILL PROPRIETARY COMPANY

The semi-annual report of the Broken Hill Proprietary Co. of New South Wales for the half year ended May 31, 1910, shows unusual disturbance of operations due to various causes, but principally to difficulties with coal supply due to a strike of coal miners. The zinc concentration plant was idle ten weeks of the time while smelting operations were reduced to two furnaces owing to inability to obtain sufficient fuel. The gross profit for the half year amounted to £16,047 9s., which, after deducting £8187 2s. 1d. for depreciation, left a net profit of £37,861 6s. 11d. The total silver output was 2,004,702 oz., inclusive of ores purchased and zinc concentrate sold. Soft lead produced inclusive of the product of purchased ores, was 31,133 tons. During the period covered by the report no work was done underground except a few repairs to timber. There was treated in the lead concentration plant 126,700 tons of ore taken from old tailing dumps. At the zinc concentration plant 103,792 tons of ore was treated.

HOMESTAKE MINING CO.

The report of this company for the year ended June 1, 1910, shows that despite the discontinuance of work November 24, 1909, to January 9, 1910, 1,824,623 tons of ore were broken in the stopes, and 157 ft. of raises, 14,259 ft. of drifts, and 35 ft. of shaft, were excavated. The bullion receipts were $1,498,751 11, being derived from the milling of 1,237,381 tons of ore; an average return of $3.63 per ton. The principal improvement work of the year was in connection with the Spearfish creek hydro-electric plant. Expenditures on this amounted to $282,044, and T. J. Grier, superintendent, states that 82% of the 24,000 ft. of tunnel was excavated and that the intake dam is well under way. Total receipts for the year, including a balance June 1, 1909, of $677,339, amounted to $5,298,623. Dividends to the amount of $982,800 were paid, taxes amounted to $106,990, and the balance at the end of the year was $181,748. Mr. Grier estimates that the ore blocked but not broken is sufficient to supply the 1000 stamps of the company for twenty years.

HISTORY OF THE WATER LEYNER DRILL

By Charles A. Hirschberg

Any history of the rock-drill would be incomplete without mention of the Water Leyner drill, which marks a great advance in rock-drilling. There is no questioning the debt the mining industry owes to the invention of the reciprocating or piston type of rock-drill. The first drill brought out by J. George Leyner, in 1895, was of the reciprocating piston type. Being, however, of a progressive and inventive turn of mind, he was not satisfied with this type of drill, but began experimenting with drills involving the principle of the hand-hammer blow. He soon became convinced that this was the correct ideal for rock-drilling, since the whole energy of the blow could be imparted to and through the drill steel and cut the rock, and not wasted on inertia and friction. In the Leyner drill the only moving part is the hammer. This construction gives a weight that is light and constant at all times, permitting lighter construction and greater drilling speed. The correctness of this principle is generally admitted. Other inventors had previously experimented with drills of the hammer type, none of which, however, proved successful commercially. Mr. Leyner is, therefore, the pioneer in the advocacy, invention, and sale of drills constructed on this principle, which has proved successful. The first hammer drill which he produced did not embody the water feature, but, realizing the value of cleaning the holes from the rock cuttings while drilling, and, as the dust created by passing air alone through hollow drill steel to the cutting point prohibited the use of the drill as then constructed, he conceived the idea of passing air and water through the drill steel to the cutting point. This is very important to the mine manager, for the reason that it results in ejecting the rock cuttings during the process of drilling so that the steel is cutting virgin rock with every blow. Further, the fact that the dust is allayed at the same time, improving underground sanitary conditions, is receiving the attention of governments, notably that of the British government, particularly in South Africa and in Australia.

The first model of the Water Leyner drill was brought out in 1898 and demonstrated the value of the hammer principle as well as the water feature. The attention of Mr. Leyner has since been devoted to simplifying and strengthening the means of utilizing these two features. In late models, new appliances of utility and convenience have been added, one of which is an automatic oiling device. The importance of this is apparent, for rock-drills, more than any other class of machinery, are subjected to not only abuse, but to passive inattention and neglect as well. This device insures proper, automatic, continuous lubrication of the drill without any attention from the operator. The air-throttle, unlike that of other drills, is placed in a taper seat formed in the drill cylinder casting. This is automatically pressure-packed and consists of two parts, a handle and valve, while its location is both convenient and safe. Another important feature of the Water Leyner drill is that it permits of the use of an improved system of pointing drill holes, which, when charged with explosives and fired, break the ground more effectually than by other systems. The term 'Leyner cut' as applied to a round of holes has come into general use on account of the many upper or dry holes which can be drilled to advantage only with this drill. From the fact that the drill holes can be pointed exactly as they should be, without regard to angle, direction, or condition of the face, and are not limited in position by the unwieldiness of the machine, much less powder is required and the same breaking effect can be obtained with fewer drill holes of smaller diameter. It is possible with Leyner drills to carry out accurately every time, any system of holes that may be devised for breaking the rock to the best advantage. In other words, a hole can be started wherever desired and bottomed accurately at a predetermined point. The Leyner drill has reached such a point of efficiency that today it holds the three best American tunnel-driving records, not alone for drilling speed, but for cost per foot.

Market Reports

LOCAL METAL PRICES.

San Francisco, October 27.

Antimony	12—12¼c	Quicksilver (flask)	46
Electrolytic Copper	14½—15¼c	Spelter	7—7¾c
Pig Lead	4.70—5.65c	Tin	38½—40c

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Oct. 20	12.65	4.40	5.60	56⅞
" 21	12.65	4.40	5.63	56⅞
" 22	12.65	4.40	5.68	56⅞
" 23	Sunday.	No market.		
" 24	12.65	4.40	5.73	56⅝
" 25	12.65	4.40	5 78	56⅛
" 26	12.65	4.40	5.83	56¼

ANGLO-AMERICAN SHARES.

Cabled from London.

	Oct 20. £ s. d.	Oct. 27. £ s. d.
Camp Bird	1 12 0	1 11 6
El Oro	1 7 0	1 6 3
Esperanza	2 8 0	2 0 9
Dolores	1 5 0	1 5 0
Oroville Dredging	0 7 0	0 7 0
Mexico Mines	7 15 0	7 10 0
Tomboy	0 18 9	0 18 1½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Oct. 27.		Closing prices, Oct. 27.
Adventure	$ 8	Mohawk	$ 50¾
Allouez	43½	North Butte	34
Atlantic	8½	Old Dominion	41¼
Calumet & Arizona	59	Osceola	131
Calumet & Hecla	555	Parrot	14⅛
Centennial	20½	Santa Fe	1⅜
Copper Range	70	Shannon	12⅞
Daly West	4	Superior & Pittsburg	13¼
Franklin	11¼	Tamarack	60
Granby	33	Trinity	5½
Greene Cananea, ctf	7¼	Utah Con	24
Isle-Royale	22¼	Victoria	2¾
La Salle	10¼	Winona	9¼
Mass Copper	9¼	Wolverine	132

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Oct. 27.		Closing prices, Oct. 27.
Amalgamated Copper	$ 69⅝	Miami Copper	$ 19⅜
A. S. & R. Co.	81¼	Mines Co. of America	7/16
Braden Copper	4	Montgomery-Shoshone	⅛
B. C. Copper Co.	7⅛	Nevada Con	20½
Butte Coalition	19⅜	Nevada Utah	1
Chino	21⅛	Nipissing	11¼
Davis Daly	2	Ohio Copper	1¾
Dolores	5	Ray Central	1⅜
El Rayo	3¼	Ray Con	20½
Ely Central	3/16	South Utah	1⅛
First National	3⅜	Superior & Pittsburg	13¼
Giroux	7⅜	Tenn. Copper	37¼
Guanajuato Con	¾	Trinity	6¼
Inspiration	9⅛	Tuolumne Copper	3⅜
Kerr Lake	6⅛	United Copper	57⅛
La Rose	4⅞	Utah Copper	49¼
Mason Valley	9⅞	Yukon Gold	3⅞

SOUTHERN NEVADA STOCKS.

San Francisco, October 27.

Atlanta	$ 13	Mayflower	$ 6
Belmont	4.70	Midway	21
Booth	9	Montana Tonopah	93
Columbia Mtn	4	Nevada Hills	2.35
Combination Fraction	31	Pittsburg Silver Peak	51
Fairview Eagle	40	Rawhide Coalition	6
Florence	2.05	Rawhide Queen	—
Goldfield Con	8.35	Round Mountain	33
Gold Kewenas	6	Silver Pick	7
Great Bend	3	St. Ives	15
Jim Butler	29	Tonopah Extension	1.05
Jumbo Extension	31	Tonopah of Nevada	8.25
MacNamara	29	West End	56

(By courtesy of San Francisco Stock Exchange.)

CALIFORNIA STATE

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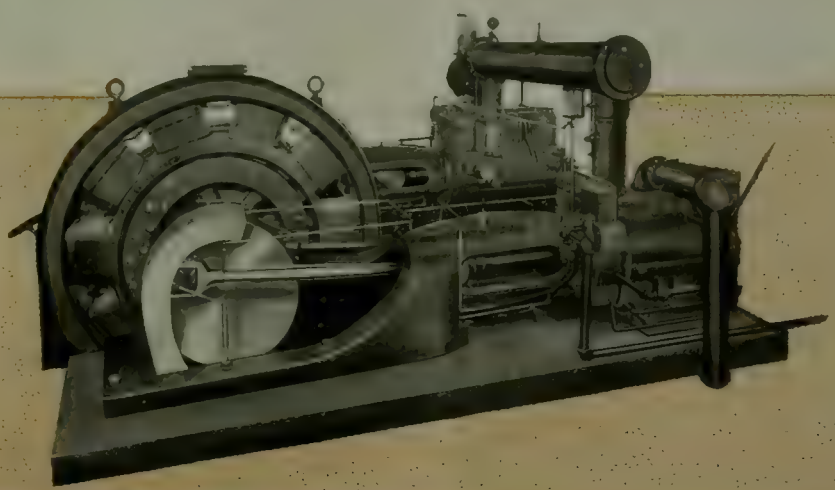

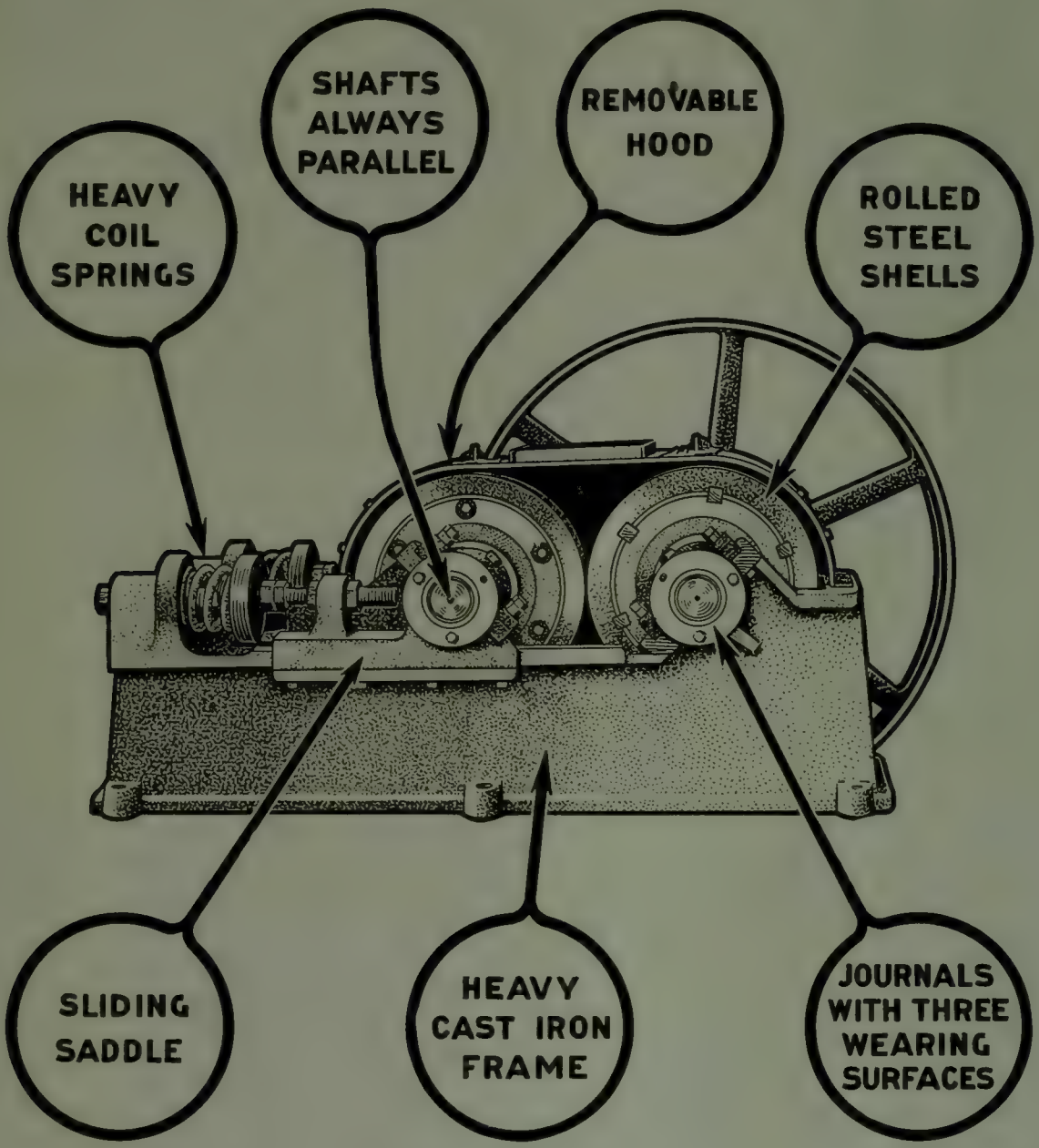

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EDITORIAL

IRON ORE shipments from the Lake Superior district are estimated at 44,400,000 tons this year, equivalent to about five per cent increase over the output for 1909.

MEXICAN mining properties must be properly surveyed and marked by monuments before next January. Fine and loss of property is the penalty for neglect to make the surveys. Mine owners would do well to take prompt action in the matter.

LOSS due to the recent fires in National Forests in Montana and Idaho is estimated to have amounted to six billion feet of timber. The gross value is put at $15,000,000. How much of this amount can be saved by sale of fire-killed timber is uncertain but the Forest Service is endeavoring to interest lumbermen by offering the stumpage at greatly reduced prices.

PORCUPINE continues to make a good showing. One of the things which augurs best for the new Canadian goldfield is the substantial character of the men who are taking hold of its development. With the Canadian Copper Company controlling the Dome, and the Consolidated Gold Fields of South Africa, Ltd., acquiring the Rea, the mines are sure to have both ample capital and excellent professional direction.

AN AMBITIOUS plan to generate power in the Grand Canyon of the Colorado by means of a dam 700 feet high, is under discussion. The difficulties in the way of building and maintaining such a dam without danger to the people below would be immense and may well prove insurmountable. Until, therefore, some adequate discussion of the technical problems involved is available, the project need not be taken seriously.

NEW ZEALAND is to entertain the members of the Australasian Institute of Mining Engineers January next. The Institute will assemble at Auckland January 25 and visits will be made to the Thames, Waihi, Karangahake, and Waikato districts, as also to the Rotorua Hot Springs. Extensive preparations for the meeting are being made and we can safely congratulate in advance the engineers who may find it possible to attend.

CONGRESS adopted last session a curious provision to the effect that items in an appropriation bill, as agreed on in committee, are not to be made public except as the bill is read on the floor of the House. Since an item once read is not subject to a point of order and members can not pos-

sibly know what is in the item until it has been read, the practical effect will be to increase greatly the already large power of the appropriations committee.

DESERVED honor has come to Mr. C. E. Munroe, who has been made president of the section on explosives of the eighth International Congress of Applied Chemistry, which is to meet at Washington, 1912. Mining men know Mr. Munroe mainly as the one who organized the investigations of explosives now being carried on for the United States Bureau of Mines by one of his students, Mr. W. O. Snelling. Aside, however, from this, Mr. Munroe has done research work of high character.

SILVER continues to rise, standing now at 56 cents. This is greatly to the delight, as it is to the profit of the mine operators in the Cobalt, Tonopah, and other silver-producing districts. The immediate cause of the increase in price is said to be speculation in India and China. Back of that and as a solid basis for the speculation stand improved business conditions in the Far East and a wider local demand for silver in the arts. When one photographic supply company endeavors to contract for ten million ounces yearly, new point is given to the admonition 'Take a Kodak with you.'

QUEENSLAND'S gold production in 1909 amounted to £1,721,386, and the total recorded output has been £22,137,259, according to figures in the *Queensland Government Mining Journal*. New South Wales, among the States of the Commonwealth, has now the largest annual production, if all minerals be taken into account, it amounting to £7,403,210. Western Australia comes second with £7,226,544, and Queensland third with £3,656,564. New Zealand now adds £2,678,685 annually to the mineral wealth of the world. The total yearly output of the Commonwealth and New Zealand now reaches £27,286,464.

PYRITE contains, as is well known, two molecules of sulphur. It has also been known in a general way that one of these could be driven off at relatively low temperatures. Attempts to use this information commercially in the roasting of ores have not been successful and exact data regarding the composition of pyrite and the temperature at which it may be broken down are much needed. A start has been made at the University of California where an informal association of instructors and advanced students of chemistry is this year working on the sulphur problem under the inspiration of Mr. F. G. Cottrell. It has been determined that the first molecule of sulphur is driven off at 625 to 680° C. Within these limits the actual temperature seems dependent upon the length of the roasting. Mr. Arthur L. Day and his associates in the Geophysical Laboratory at Washington are understood to be engaged in an elaborate investigation of pyrite and the commonly associated sulphides. From these and other studies metallurgists may confidently expect data that will be of wide service when applied to practical problems.

GASOLINE motors are being introduced in the coal mines for gathering cars. Between small mines where mule haulage is still profitable and large ones where electricity is economical, there are many, as there is a stage in development of the large mines, where motors are economical. The delay in introducing them has been due to danger from their operation. Provision is now made against this by passing the exhaust through a tank containing lime water. One of the recent types of 4-cylinder water-cooled engines develops 50 horse-power and hauls coal at a cost of one and one-half cents per ton mile, allowing 5 per cent for interest and 10 for depreciation. While haulage problems in collieries are much more important than in metal mines there are places where such an engine is used to advantage in handling ore, the Yellow Aster mine of California being an instance.

JUMBO EXTENSION has been much in the public eye recently. The properties owned by this company at Goldfield, Nevada, are so intimately interrelated with those belonging to the Goldfield Consolidated Mines Company that under terms of an agreement made in settlement of conflicting apex and dip claims, they are worked by the larger company, the profits on the ore being paid to the Jumbo Extension Mining Company. There has been minor friction between the two companies, and Mr. C. A. Herzig, who recently examined the properties as consulting engineer for the Jumbo Extension, made recommendations looking toward certain changes and increased activity in working Jumbo Extension ground. Negotiations are also under way for use of a separate shaft and for the Nevada Goldfield mill to handle this ore. In due time doubtless this or other equally satisfactory arrangements will be effected. That the ground is rich is well known. Mr. Herzig's estimates of reserves have been widely published. There has been an attempt to discredit his estimates, and in our news columns October 22 a rumor to the effect that they were exaggerated was quoted. Such statements are common. The signed statement of an engineer should naturally be given greater weight than an unsigned rumor.

Geological Survey Men and Foreign Travel

Geological investigations within the Panama Canal Zone have heretofore been primarily directed to solution of immediate economic problems. Mr. Ernest Howe, among others, has made notable studies of this sort. A great public work, however, such as the Panama Canal, should be carried on as well as conceived, along the broadest possible lines. If there are data of value to science to be collected and recorded, full provision for this should be made as well as for 'making the dirt fly'. We are glad to be informed that officers of the U. S. Geological Survey are to make a complete examination of the Culebra cut. The investigation should be extended to cover the whole Canal Zone. It has been one of the curious anomalies of the public service that, whereas officers of other branches may travel in any part of the world where they

may be called by their work, a member of the Geological Survey can not go outside the United States except at his own expense. Work in Alaska is provided for by special appropriation but even when the Director officially represents this country abroad as at meetings of the International Geological Congress, he must personally meet the bills. When it was desired to learn something about the actual working of the system of leasing mineral lands as practised in Australia, it was necessary to send a special agent there at private expense. The Geological Survey is practically the only branch of the public service against which this discrimination is practised. It is unjust to the men, operating either to limit their opportunities to get at the facts essential to their investigations, or to subject them to large personal expense in spite of their small salaries. There should be reason in all things and the demand for work at Panama may well be made the occasion for providing for a reasonable amount of foreign travel by the geologists where it is to the public interest.

The Creed of Conservationists

In the last few years no subject has been discussed in America more generally than the necessity and means of conserving our natural resources. There is a wide realization of the fact that the time has come when we must change our methods of exploitation and development, to the end that there be less waste of the heritage we have received, and a larger residuum to pass on to our successors. We are all conservationists, at least in principle; the sharp differences of opinion which have arisen are with reference to means to be adopted and the particular steps to be taken. Many men have many minds, and opinions result from inheritance, training, and environment as well as from sound argument. Equally earnest and honest men differ widely as to what changes in our system are necessary and what are wise. The first requisite to any concerted action is a correct understanding of the position of each party to the controversy. In parts of the West there has been much condemnation of the conservation movement. We believe it to have been founded largely on misunderstanding. Mr. Gifford Pinchot, who stands as the leading proponent of the movement, has recently issued a full statement of the plans and purposes of himself and his followers. There need be no doubt as to exactly what Mr. Pinchot proposes, and there can be no doubt that up to the present he is the most conspicuous and influential leader of the conservation forces.

In his recently issued book, 'The Fight for Conservation', Mr. Pinchot states the principles of his party substantially as follows:

"The first great fact about conservation is that it stands for development. There has been a fundamental misconception that conservation means nothing but the husbanding of resources for future generations. Conservation, however, demands the welfare of this generation first, and afterward the welfare of the generations to follow. There may be just as much waste in neglecting the development and use of certain natural resources as there is in their destruction. Conservation stands emphatically for the development and use of water power now. It stands for immediate construction of navigable waterways. The development of our natural resources and the fullest use of them for the present generation is the first duty of this generation. In the second place, conservation stands for the prevention of waste. In the third place, the natural resources must be developed and preserved for the benefit of the many and not merely for the profit of a few. Conservation means the greatest good for the greatest number for the longest time. Conservation demands the application of common sense to the common problems for the common good."

Stated in this form, there will be but little disagreement with the principles Mr. Pinchot has enunciated. That development is of first importance is particularly the creed of the West, and certainly there can be no dispute as to use being the best possible means of conservation. There can be no gain in allowing water to run unused to the sea; and, while forests may be destroyed and coal burned, if farms and prosperous agricultural communities replace the one and manufactured articles result from the other, the best of conservation has been effected. All this, however, affords no excuse for continuing methods of use that involve unnecessary waste or, and here is the field for dispute, giving to the few the opportunity for development of the resources if it be to the unfair expense of the many. It is around Mr. Pinchot's third proposition that conflict mainly rages. There are those who argue that conservationists have nothing to do with questions of ownership, that the latter involve problems in political economy rather than in technology. There are also those who insist that the indirect benefits to a community following from development of a water-power, for example, are sufficient compensation to the community; that the direct benefits should go to those who give time or service to bring about the development. Others insist that some part at least of the direct benefit shall go to the people at large as well as to the promoters and immediate owners. Over all is the cloud of controversy that has obscured discussions of monopoly since development began. It is clear that problems of conservation and problems of ownership at times run counter, but it is equally evident that in the present state of public opinion the two must be considered together. The large corporations familiarly known as 'trusts' are so unpopular that any public enthusiasm for conservation, if it inure to their benefit, is unthinkable. This may be foolish and short sighted, or it may be wise and far sighted; in any event, it is one of the facts to be considered. Let us agree that there shall be development, let us work toward better technical performance to the end that waste be reduced, but let us also recognize that problems of ownership will inevitably enter into the matter, and as citizens let us keep open-minded and fair. There can be no satisfactory termination of the matter until it is settled right, and a right settlement must be one which is fair to both corporations and people.

Native Methods in Siberia

By Fred L. Lowell

During a recent trip to the placer mining regions of eastern Siberia, I had an excellent opportunity of seeing the working methods used by the Russians, Chinese, and Koreans in the alluvial diggings of that country. Their ways, in many respects, resemble those used in California in early years. They were so interesting, and showed such ingenuity that they will bear describing, as will also some of the customs of the people.

The principal means of entry into this mining country is by way of Vladivostok and thence by the Trans-Siberian railway and river steamers. Before landing at Vladivostok, all passports had to be examined and 'visayed,' or countersigned, and the baggage examined. At every hotel the passport is taken from the traveler and sent to police headquarters for examination, and hotel keepers are subject to a fine if they neglect to perform this duty. I

Native Batea of Wood at the Left.

found it inconvenient to be awakened at 5 o'clock in the morning to deliver my document and answer questions, but had to bow to the inevitable. From the moment that I landed, a military atmosphere appeared to surround me. The city is bristling with fortifications and the population seems to be composed mainly of officers. No cameras are allowed to be used in the city and they are promptly confiscated if this command is disobeyed. Then again, the great Trans-Siberian railway is a strategic system, and the authorities object to snap-shots of the stations or guard-houses along the line, but by a little strategy of my own I managed to get a few. The railroad is of 5-ft. gauge and the rolling stock for passenger service is modern and comfortable, especially on the express trains. A train consists of five coaches, including a dining car in which good meals may be obtained at moderate prices. These trains travel about 20 miles an hour and make many stops. The locomotives burn wood.

In passing through Manchuria, I saw much rich land suitable for growing grain and vegetables. I am told that the native Chinese are not permitted to build villages within a certain number of miles of the railway for strategic reasons. On crossing the border into Siberia all passports and baggage had to be examined again, after which we passed on northward to the head of navigation on one branch of the Amur river. The ferry boat crossing the river is anchored by several hundred yards of cable which is supported on floats, and the boat is forced across by the current of the stream. Some of the river steamers are side and others stern-wheelers like the ordinary Mississippi River boats. They burn wood, of which there is an abundant supply, taken on at intervals along the river. I used a Siberian pony in

The Native Current Ferry.

traveling from the river to the mountains. This animal is small, standing about fourteen hands, but tough and hardy; well adapted to the work on the bad roads.

On arriving at the placer mines, I was surprised at the amount of mining that had been done and was still being done by the Russians, Chinese, and Koreans. In some places, all the gravel that would

Removing Water With Bucket and Sweep.

pay to work had been washed and great piles of tailing remained to be re-washed, possibly, at some future time by modern machinery with low working costs. All the alluvial ground that I saw was 'Cabinet' or Government ground, and the Chinese lease it from the Government, the leases being either for one or two years. The gravel averages about 14 or 15 ft. in thickness and the payable portion next to the granite bedrock is 1 to 3 ft. thick. The rich portion is called 'plast.' After diverting the waters of the

stream, the unprofitable gravel is stripped off as fast as the ground thaws, which is at the rate of about 6 to 7 in. per day, unless it be covered with a clay overburden. This thaws 1 to 2 in. per day, and in one instance I saw the men using picks to dig up this frozen clay in order to get to the gravel quicker. Although they save time in this way, yet they waste much time in other ways, such as drinking tea and standing around smoking. The working season is about 160 days and only a day shift is employed. The custom is for a company of Chinese to take a lease on a section of a creek and work it in co-partnership. The men appoint one of their number as 'boss man' and obey his orders. The Government has an agent in the district who supervises the work. He locks the boxes in which the gravel is washed and is present when they are cleaned up at the end of each day. The Chinese remove the gravel from the riffles and pan it down in a wooden pan of their own pattern, after which the gold is separated from the black sand by blowing, and the inspector seals it up and puts the Government stamp on the package. He is responsible for the percentage claimed by the 'Cabinet.' He also keeps the records of the gold output of the district and superintends the putting down of prospect shafts in virgin ground. In some instances when the lease is a short one, the Chinese strip ground that would pay to wash, but often discard it in order to get down to the richer bedrock gravel more quickly.

The water from the thawing gravel is drained into a swamp from which it is raised by several devices. One consists of a bucket attached to one end of a weighted pole similar to the old fashioned well-sweep. Another is by a bucket which is swung by a rope between two men, much the same as an ordinary swing, except that the bucket is lowered to the pool to be filled and raised on the forward swing and emptied about 10 ft. higher up into a flume. A third method is to use a wooden pump, as shown in one of the illustrations. The gravel is transported in barrows to the washer, which consists of a box about 8 ft. long with an iron screen on one end having ½ in. holes. The coarse is thrown to the waste pile and the fine gravel, dropping through, passes over the riffles, which sometimes have fine twigs packed between them for catching the gold. The cleaning pan is made of wood with a smooth concave face. One of these bateas is shown in an accompanying illustration. In appearance it resembles the cross-section of a jar.

On one of the rivers, I witnessed the operation of some native dredges. These consist of two rafts made of logs. One raft has a well in the centre for the scoop, which is made of iron and is fastened to the end of a long pole. The rafts are held in place against a three-mile current by four spuds, one at each corner, and sometimes by a guy-rope to the bank. Before lowering the scoop, the bottom of the river is loosened by dragging the end of an iron-shod pole through it, and then the scoop is dragged from the farther end of the raft to the windlass, after which it is lifted up to the platform. The gravel is then shoveled into the hopper of the washer and the oversize thrown into the river. The box is the same as those used on shore except that it is set higher

Unloading River Steamers.

Washing Gravel in the Puddling Box.

Gold Dredgers at Work.

Dredging a Sand Bar.

and the water for washing is pumped from the river. These dredges do not work to bedrock, but handle gravel containing gold from surface concentration and are more effective in shallow water. The 'Cabinet' officer superintends the clean-up and puts his official seal on the package containing the gold. The Koreans who operate these dredges make enough money during the summer season to keep them through the winter in Korea, returning to the diggings for the next season's work.

These operations are some of the many that are going on in the headwaters of the Amur river and the production in some of the districts has amounted to many thousands of rubles, as shown by the 'Cabinet' records. There are many instances where illegitimate mining is carried on by Chinese who are taking out gold from placers unknown to the officials, and who do not return royalty to the Government. These men are constantly appearing at supply points for their provisions and disappear mysteriously during the night to pursue their labors. Like other mining countries, this one has its dangers. Many crosses by the roadside bear witness to the murder of some unfortunate Chinese or Korean who has been shot from ambush as he was traveling to the river to embark for home. These bandits do not give the victim a chance for his life; not living content with robbery alone, they kill as well. The police write a description of the deed or what is called a 'protocol,' which goes to headquarters and is forgotten. Foreigners are not molested as much, for in such case, more energy is exerted by the police to capture the murderers and the chances of a residence in a penal settlement are greater. Speaking in a general way, the country is a good one for mining. Placer gold is scattered over a wide area, very rich in some districts and just profitable in others. Many of the difficulties encountered in Alaska must be overcome also in Siberia.

SHRINKAGE OF EARTHWORK

How much earthwork shrinks and the comparison of excavation and embankment quantities are very important subjects upon which the opinions of engineers are much at variance. They are also much mooted subjects between engineers and contractors. Shrinkage is provided for in several ways: (1) By raising the height of crown above the established subgrade by a percentage of embankment height. (2) By adding additional width to the standard crown width. (3) By combining methods one and two. (4) By adding a shrinkage percentage to the height of embankment, computing a new slope distance for this corrected height, thus increasing the width between slope stakes.

The Colorado bumping table is a suspended plane, hanging by rods. A cam pushes the table out of its natural position, and the table swings back toward its original position, striking sharply against a stationary object, which gives the table a 'bump,' hence its name. For some purposes it is a very satisfactory concentrating device, but not extensively used away from its home in Gilpin county, Colorado.

Lead and Copper Slags

By James A. Barr

*In lead smelting the operator is confined in the beginning in the selection of charges by the comparatively rigid limits of the regular type slags, a number of which are given in the following tables. By this statement is not meant that the so-called 'type slags' are the only ones that will work properly but rather that certain slags which have been tried are known to be satisfactory. The metallurgist may often have to sacrifice what he considers good metallurgical practice to obtain the greatest net profit, hence the type slags are not always followed. In the following table the analyses of type slags are given with the remarks on each. Under the columns headed MnO, MgO, BaO, etc., are given the maximum percentages of these substances that have been used with the corresponding type. By this it is not intended to imply that the entire list of impurities would be allowable in one slag to the extent of the maximum figures given. For the maximum percentages of one impurity in the presence of others, the reader is referred to the explanations following the table. A slag is designated as whole, half, quarter, etc., according to the ratio of the FeO + MnO to the CaO + MgO + BaO. Thus in a half-slag the CaO, etc., is approximately one-half the percentage of FeO. When the MgO, etc., is added to the CaO it is added according to its replacement value; thus 40.3 lb. of MgO is equivalent in fluxing power to 56.1 lb. of CaO. By the word 'charge' as in 'per cent lead on the charge,' is intended the blast-furnace charge including ore and fluxes but not the coke or slag for re-smelting. In the 'Table of Limits' is given the maximum, minimum, and average figures for slag constituents found in practice, also figures for other data important to silver-lead smelting. Unusual figures are enclosed in brackets.

SLAG TYPES

		Per Cent.			Limits with Corresponding Type Slag. Per Cent.				
		SiO_2	FeO + MnO	CaO + MgO + BaO	MnO	MgO	BaO	ZnO	Al_2O_3
A	1	35	28	28	[8]	5	2-5	10	6-10
	1	36	31	23	5	5	2-5	10	6-10
B	2	34	34	24	5	5	2-5	10	6
	[8]	35	38	17	5	5	2-5	8-15	6
C	2	31	38	21	5	5	2-5	8	6
D	1	30	40	20	8	5	5	8	5
E	1	32	47	11	8	5	5	[8]	5
	2	30	48	12	8	5	5	8	5
F	1	28	50	12	8	5	5	8	5
	2	28-30	54	6	8	5	5	8	5

REMARKS

A—Useful in case of an excess of silicious ore and for ores containing much alumina. It is not adapted to ores high in zinc.

B—More fusible and faster running than A, but still too silicious for ores high in zinc.

C—This type may be used successfully to work off zincy ores.

D—An excellent slag adapted to working irony ores; also good for zincy slags.

E—A good slag for working off irony ores, where they are in excess or most profitable to treat.

F—Not as good as the preceding types and of rather high specific gravity. Only used in case of an excess of irony ores and where silicious fluxes are not available at a reasonable cost.

*Abstract from 'Smelting Properties of Copper, Lead, Gold, and Silver Ores,' in 'Testing for Metallurgical Processes.'

SLAG CONSTITUENTS

		Per cent Maximum	Minimum	Average
[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	MgO	5.0	2.5	3.0
[illegible]	MgO	2.5	2	2.3
[illegible]	MgO	6.0	4	5
[illegible]	MgO	4	3	3.5
[illegible]		8	6	7
[illegible]	ZnO	15	9	12
[illegible]	Al_2O_3	10	6	8
[illegible]	S	1	0.5	0.7
[illegible]	Pb	1.5	0	0.5–1.0
[illegible]	Ag	2 oz	0.5 oz	
[illegible]	Au	0.01 oz	Trace	

GENERAL DATA

[illegible] volatile	20	10	
[illegible] volatile	30	20	25
[illegible]	15–20	12	14
Lead in matte	18	7	12–14
Copper in matte	6.0	3	
Copper in matte	3	1.6	2–2.5
[illegible] in matte	25	20	
Matte fall	20 (1:5.0)	8	8–10
[illegible]	10	5	
Assay base bullion:			
Silver, Ag	300 oz	50 oz	
Gold, Au		0.1 oz	
Lead on charge	20	6	10
Recovery of lead	95	90	
Recovery of gold	98	95	
Recovery of silver	98	95	

[1]Successful runs have been made with 13% SiO_2.
[2]Iron is too high for speed in smelting with a slag containing SiO_2 32, Fe 32, Mn 2.5.
[3]An actual slag contained Pb, 0.8%; Ag, 1.0 oz.; Au, 0.004 oz.
[4]Depending upon completeness of roast.
[5]Figured on the basis of good brm coke with 10% ash.
[6]Ratio of matte to ore plus flux.

EFFECT OF SLAG CONSTITUENTS

Alumina.—Aluminous slags will generally be slow running. They require a higher heat to make them flow properly than their temperatures of formation would indicate. Iles recommends that the iron content be kept well advanced and the silica be between 29 and 31 per cent.

Baryta.—This enters both the slag and matte and increases the specific gravity of slag so as to make proper settlement of matte difficult, otherwise it is a good alkaline earth flux. Baryta ores have been successfully handled by using a slag running SiO_2, 35 to 37%; Fe, etc., 20; lime, 27; BaO, 14.

Lime.—In general high lime makes slags low in lead except where zinc conflicts and requires the iron to be increased.

Magnesia.—Magnesia is especially troublesome in the presence of zinc and alumina, forming streaky, pasty slags high in lead. In a slag containing 8% zinc and 2 to 3% baryta, MgO is troublesome and 5% will give serious trouble. Magnesia alone and under 5 to 8% will give little trouble when intelligently handled. It has 1.4 times the replacement power of lime.

Potash and Soda.—These elements in excess will cause slags to run high in lead but good results may be obtained by using a hot slag containing 17 to 22% of alkaline earths.

Zinc.—Zinc decreases the fluidity of the slag and, while it lowers the temperature of formation, more fuel is required to make the slag flow properly and keep the lead content down. Zinc enters the matte and decreases the specific gravity making it difficult to settle properly. An excess of zinc is best taken care of by irony slags as indicated in the table. It is customary to preserve the slag type by replacing lime with one-half the zinc oxide present, and adjusting all the constituents so as to add up to the percentage of the original total. The amount of zinc volatilized depends upon how well the ore has been roasted and the zinc changed into oxides; a poorly roasted ore will result in a low volatilization of zinc. The amount of zinc volatilized and going into the matte will run from 10 to 20%. Following is example of slags, etc. resulting from smelting zinc retort residues.

Base bullion		Slag		Matte	
			Per cent		
Ag	875 oz	SiO_2	33.1	Ag	100 oz
Au	1.49 oz	FeO	37.5	Au	0.04 oz
		MnO	1.5	Pb	8%
		CaO	11.1	Cu	1.5%
		ZnO	10.0		
		Pb	0.77		
		Ag, oz	1.26		

FURNACE DATA

	Per cent		Saving, per cent
Lead on charge	9.1		
Coke on charge	13.0	Silver	90.8
Slag on charge	32.6	Gold	92.4
Sulphur on charge	3.7	Lead	92.0
Matte formed	7.2		

GENERAL REMARKS

The slags to be re-smelted, consisting regularly of the shells from the slag dump-pots and any foul slag from clean-ups or unfavorable runs, will average about 20 to 30% of the total 'charge,' and even 35 to 40%; the term 'charge' referring to ore fluxes, but not the coke or slag for re-smelting.

Iron.—Where iron fluxes are dear a good slag would be: SiO_2, 32%; Fe, 32; CaO, 22; Zn + Al_2O_3, 10.

Base Bullion.—There should be enough precious metal on the charge so that the silver content of the base bullion will run between 100 and 300 oz. per ton and at least 0.10 oz. of gold per ton, as the refiners pay only for 0.50 oz. or over. The richer the bullion the greater the amount of precious metal that will be found in the slag and matte. A typical base bullion contained, Ag 266 oz., Au 3.49 oz., Pb 95.0%, As 0.28, Cu 0.70.

Lead.—For efficient collecting of the values, the percentage of lead on the charge should not be under 6 and is better 10. Over 20% is liable to force too much lead into the slag, though in one smelting works as high as 30 to 35% lead has been placed on the charges and the resulting slags have contained less than 1% lead under favorable conditions.

Fuel.—The quantity of fuel is lowered by high sulphur and a high percentage of lead on the charge, also by an easy running slag having a low temperature of formation. The maximum fuel under these conditions has been as low as 9 to 10% of coke.

Matte Fall.—The quantity of matte formed will depend upon the amount of sulphur available after volatilization and slagging. The slag will contain about 1% sulphur and the volatilization will be from 20 to 30% depending upon the condition of the ore; an unroasted ore will give a higher loss of sulphur than a roasted product. The matte fall should average about 10% in order to keep down the silver-lead content of the slag, and allow the handling of more impure and refractory ores than the lower matte falls given in the table. Low matte fall may be used with pure silicious ores in the absence of $BaSO_4$. It will also depend upon the cost of roasting and re-smelting the matte. Where manganese is substituted for iron in the charge it lessens the production of matte.

Matte Content.—The matte should ordinarily con-

tain not less than 5 and not more than 14% copper to cleanse effectually the slag of silver. When in excess of 14 some of the copper is reduced and goes into the base bullion where it must be removed by drossing and returned to the blast-furnace. Since the matte is roasted and returned to the furnace, the copper accumulates and when in excess of the limit desired, it is removed and smelted separately to form a converting grade of copper matte. The lead, which is mostly volatilized in this process, is collected in the bag house. The following charge may be used for the concentration: (1) matte roasted to 4% sulphur; (2) silicious ores as free from S, Au, and Ag as possible; (3) copper ores; (4) limestone; (5) slag; (6) coke, 13 to 14%. The slag should run between 35 and 42% SiO_2. The matte formed should contain about 50% Cu and 15 to 20% Pb. Scrap iron may be added to the charge to the extent of 5 to 10% to lower the lead content of the matte, which should ordinarily run between 12 and 14% but can be reduced to 7 or 8% should the conditions warrant. It is not advisable to use scrap iron when there is much zincblende present, because metallic zinc is reduced and oxidizes to ZnO in the upper part of the furnace, forming accretions and preventing free combustion of the coke from the coating of oxide upon it. A lack of fuel to sufficiently superheat the slag and give proper reducing conditions is quite apt to produce a matte high in lead. In general a slag of 25 to 28% FeO is best suited for producing a matte low in lead. The lead also increases with the copper in the matte, namely, a 40% copper content may call for 20% lead. A typical matte analysis is: S, 20.29%; Fe, 35.0; BaO, 0.73; Zn, 6.42; Pb, 10.96; Cu, 14.8; Ag. 77 oz. per ton; Au, 0.18 oz. per ton; specific gravity, 4.64.

Speiss.—When sufficient arsenic is present to form a speiss, 2.3 times the weight of arsenic equals the weight of iron needed to form it. This must be subtracted from the total iron in the charge as it is not available for slag or matte. The per cent of speiss formed may be approximated by running a regular lead assay on the ore and noting the weight of the speiss button found with the lead. Ores forming much speiss should be run with a silicious slag in order that the temperature of the furnace may be high enough to keep the speiss liquid.

Losses.—In best practice 90 to 95% recovery of the lead and 98% of the gold and silver can be obtained.

Flue Dust.—The amount of flue dust will run from 0.3 to 3.5% (and more) of the total charge according to the amount of fine material and the strength of the blast. An average figure would be 2½ per cent.

Lead Roasting.—The question when to roast will be decided by the matte fall desired. Sulphur is commonly debited at 25c. per unit, which represents the approximate cost of handling and reworking the resulting matte. Then, since for each unit of sulphur driven off in a roast, 25c. is saved, the advisability of roasting may be estimated by taking into account the cost of roasting and the resulting losses which are from 2 to 7% of the lead and 1 to 5% silver, but can be kept within 3 to 4% lead and 1 to 2% silver with a trace of gold. The change in weight of a roast approximates the replacement of sulphur by oxygen and also in the case of a pot roast the loss of CO_2 of the limestone when used.

The copper slags are usually classed according to the ratio of the oxygen on the base side to the oxygen on the acid side. Iron and lime oxides being the chief bases and silica the principal acid.

(1)	Subsilicate	$3RO{\cdot}SiO_2$
	Ratio 3 to 2.	
(2)	Singulosilicate	$2RO{\cdot}SiO_2$
	Ratio 2 to 2.	
(3)	Sesquisilicate	$4RO{\cdot}3SiO_2$
	Ratio 2 to 3.	
(4)	Bisilicate	$RO{\cdot}SiO_2$
	Ratio 1 to 2.	
(5)	Trisilicate	$2RO{\cdot}3SiO_2$
	Ratio 1 to 3.	

In these equations RO represents the oxide of any base or combination of bases.

The silicate degree of a complex slag is found by taking the percentage of oxygen in the SiO_2 or acid side and that on the base side by the use of the following table and determining the ratio.

	Per cent oxygen.
Silica, SiO_2	53.35
Iron oxide, FeO	22.2
Manganese oxide, MnO	22.6
Lime, CaO	28.6
Magnesia, MgO	40.0
Baryta, BaO	10.5
Alumina, Al_2O_3	47.0

For example, take slag of the following analysis:

	Per cent.	Per cent O on base side.	Per cent O on acid side.
SiO_2	40.0	...	21.3
FeO	30.0	6.7	...
MnO	5.0	1.1	...
CaO	20.0	5.7	...
MgO	5.0	2.0	...
		15.5 = x	21.3 = y

x:y as 15.5:21.3 = 1:1.37; approximately 3:4 or $3RO{\cdot}2SiO_2$.

The **subsilicate** would only be used in case of a great excess of basic ores, usually irony, with silicious fluxes not available at a reasonable cost. Slag of this type requires a high temperature to run properly; they are corrosive to crucible linings, and are of too high specific gravity to make a clean slag, and hence are generally unsuited to economical smelting except in extreme cases. The **singulo silicate** enters the range of ordinary commercial slags and is used where iron or other bases are in excess. It is still of too high specific gravity to give a perfect settlement of the matte and is seldom made where silicious ores are obtainable at a fair price. The **sesqui silicate** is a mixture of the singulo silicate with a bisilicate, and in the neighborhood of this silicate degree the majority of the copper slags may be placed. It has a low melting temperature and runs smoothly without forming a thick crust over its surface. It is low enough in specific gravity to permit a complete and rapid settling of the matte. It is perhaps the most desirable slag when conditions permit its use. The **bisilicates** are used in case of an excess of silicious ores. While they require a higher

percentage of coke on the charge than the preceding slags still when they are properly melted, give a slag of low specific gravity and a very clean separation of the matte. A **trisilicate** comes more within the range of the iron blast-furnace. The following table gives the limits of the different slag constituents as found in modern practice.

supplemented by the remarks on alumina which are given following the table. The table may be used in a like manner to find the average figures for other slag constituents for all common types of smelting, also other data, such as matte fall and fuel on charge. The column heading 'Min.' is intended as an abbreviation for minimum. These columns contain the

CONSTITUENT LIMITS FOR COPPER SLAGS AND FURNACE DATA

	Ordinary matte smelting				Semi-pyrite smelting				Pyrite smelting				Reverberatory smelting			
	Average per cent		Special per cent		Average per cent		Special per cent		Average per cent		Special per cent		Average per cent		Special per cent	
Constituents of slags	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
SiO2	44	28	[illegible]	25	42		52		Singulo silicate types				48	25	45	20
Al2O3	10		14		10		18		10		14		10		18	
FeO	60	20	65	18		18		15	65				65	20	70	18
MnO			45													
CaO (or the equiv.)	8	10	10	6	30	10	40		28	10		8	28	10	10	0
MgO		0	12	0	5	0	15	0	5	0	15	0	5	0	15	0
K2O + Na2O	5	0			5	0			5	0			5	0		
BaO			30													
BaSO4			5													
ZnO	6	0	10	0	6	0	15	0	6	0	15	0	6	0	15	0
Cu	0.5 to 1.00		0.5	0.2	same				same				same			
S	1.5	1.0	1.8	0.8	same				same				same			
PbO			10	0		10	0			10	0				10	0
FURNACE DATA																
Zinc volatilized and going off in gases	20	10			20	10	..	..	20	10	..	..	10		.	..
Slag tapped and slagged	75	50			80	60	95	.	85	70	95	..	35	25	..	.
Fuel	15	10	17		15	8	..	..	8	1	..	.	35	25	bit. coal	
Copper on charge	15			..	..	0.5	..	..	..	..	..					..
Copper in matte	50	10		35	50	8	..	0.5	50	10	..	..	50	10	..	1
Copper precipitation in matte	65			..	..	..	..		..	.	.		..	.	..	.
Sulphur in matte	25	23	29	20	..	..	..	..	..	..	.	..	..	.	..	.
Recovery of copper	95	90			..	same				same			same			
*Concentration ratio	7:1		10:1	.	10:1		22:1	..	10:1	..	22:1	.	7:1	.	..	..
Gold in slag	.	Trace	.	.	..	..	..	..	..	..	.	..	..	..	..	
Silver in slag oz.	1.0	0.25	.	0.20	.	same				same			same			

*By the concentration ratio is meant the ratio of the per cent copper on the 'charge' to the per cent in the matte.

By 'ordinary matte smelting' is meant that practice which uses raw or roasted ore with low concentration, of say 4 or 5 into 1, and 10 to 15% of fuel, and primarily for the reduction of copper ores with gold and silver as by-products. By 'semi-pyrite' smelting is meant that type which uses a high concentration ratio, silicious slags, as small amount of copper on the charge as possible, pyrite being used as a flux and fuel if available, but primarily smelting is for the collection of gold and silver from unroasted ores that are not suitable for amalgamation or leaching methods. By 'pyrite smelting' is meant a smelting of raw heavy sulphide ores for the collection of their copper content, also gold and silver, with the least possible addition of lime and silicious flux. It is not possible to define sharply all types of smelting by these three divisions as there will be gradations of one into the other as conditions require. Ores for regular pyrite smelting should contain 60% of pyrite or its equivalent.

Example.—The use of the table may be illustrated as follows. In deciding on a slag for smelting a copper ore by ordinary matte smelting it is desirable to see how high an alumina content may be used. Opposite Al_2O_3 in the column headed 'Constituents of Slags' and in the column headed 'Ordinary Matte Smelting,' 'Average per cent Max.' is found the figure 10, which indicates that under average conditions 10% Al_2O_3 may be used in a slag. In a like manner under the column headed 'Special per cent Max.', is 15, which indicates that in special cases 15% Al_2O_3 may be used in a slag. These figures are minimum or lowest figures found in average as well as special cases.

NEW TOPOGRAPHIC MAPS

The topographic maps named below have been recently issued by the United States Geological Survey:

Bedford, Pa.
*Bisbee, Ariz.
Bouldin, Cal.
Breckenridge special, Colo.
Carson Sink, Nev.
Castle, Cal.
Clay, W. Va.
Danforth Hills, Colo.
Eugene, Ore.
Fish Springs, Utah.
*Furnace Creek, Cal.-Nev.
Galt, Cal.
Gassaway, W. Va.
Grand Hogback, Colo.
Headreach, Cal.
Higdon, Mo.
Isleton, Cal.
Jensen, Utah-Colo.
Jersey, Cal.
*New editions.
Linden, Tex.
Macon, Mo.
Montevallo, Ala.
Montgomery, W. Va.
Mound, La.
Pawhuska, Okla.
Pleasant Grove, Cal.
Rangely, Colo.
Ray, Ariz.
Rio Vista, Cal.
Rock Springs, Wyo.
Stony Creek, N. Y.
*U. S. Relief map, 18 by 28 in.
*Waterloo, Wis.
White River, Colo.
Woodbridge, Cal.
Yosemite National Park, adm. map.
Zillah, Wash.

The United States relief map sells for 10c.; the administrative map of Yosemite National Park sells for 25c.; the other maps sell for 5c. each. A discount of 40% is allowed on purchases of topographic maps amounting to $5 or more at the retail rate. Payment should be made by certified check or by postal or express money order, payable to the Director.

National, Nevada

By H. C. Cutler

National, the latest camp to attain prominence in Nevada, is in the northern part of Humboldt county. It is about 8 miles south of old Fort McDermitt and the Oregon line, and 75 miles north of Winnemucca, on the Southern Pacific and Western Pacific railroads. It lies well up in the mountains bordering the eastern edge of Quinn River valley and, unlike the majority of camps in Nevada, is rather pleasantly situated. Water and grass are plentiful and sagebrush and green shrubbery cover the mountain sides. Cottonwood and other trees are found in the gulches near the water, but not in sufficient quantities to furnish fuel for any length of time.

At present, the population of the town and vicinity is about 750. A daily stage brings the mail from Winnemucca over a road which is excellent for the larger part of the year. Freight and express are delivered in town for 1½c. per lb. A few wooden buildings have been erected, but the town is still largely composed of tents. The camp was established in June, 1907, by Jesse L. Workman, a prospector who used an automobile for transportation and who during the past six years had been over a large part of Nevada. He was attracted to this section by stories of high-grade float found at different times by sheep-herders or cattlemen who had neither the time nor the inclination, nor yet the knowledge, to follow up and discover the source from which it came. Workman located forty claims in the vicinity, but was not fortunate enough to find the high-grade deposit. Credit for this belongs to lessees who were attracted to the camp by the reports sent out by Workman. Among these were George and Frank Stall, who had mined in California and prospected in Nevada. They took a lease on the West Virginia claim on Charleston hill and, although often discouraged, out of money, and ready to give up, stuck to it and finally found the bonanza deposit in February 1909. Meantime, four of the claims located on Charleston hill had been incorporated under title of the National Mining Company, and control of the company secured by S. W. Gundaker, who kept the lessees hopeful and working until they were rewarded by finding the highest grade ore ever found in place. Later, a change in ownership of the control caused a dispute as to the rights of the lease, and litigation ensued which tied up the property during a part of 1909 and 1910. The suits were finally compromised and on April 9, 1910, work on the lease was resumed with a year and twenty days to run. In August 1910 the lease was sold back to the parent company for a large sum, although it is generally supposed that the best of the rich ore-shoot had been extracted. From April until August 1, 1910, the production of high-grade ore alone exceeded $650,000. This ore was worked in a small pan-arrastre mill and the tailing shipped to the smelter. The ore averaged $25 per pound, assaying in the ratio of about an ounce of gold to an ounce of silver.

General View of National, Nevada.

The geology of the country, both in the mine and its vicinity, is complicated. The camp lies near the southern edge of the Idaho lava flow. To the north and east, the mountains are capped with heavy flows of basalt and the gold-bearing Tertiary eruptives do not come to the surface. Beginning at Eight-Mile creek, about two miles north of National, the rhyolite and andesite appear and can be traced for a number of miles to the south. Buckskin peak, about three miles south of camp, is nearly all rhyolite. Farther south, the more ancient rocks, such as limestone, schist, slate, and granite, appear. All of this range is being closely prospected at the present time, but so far nothing of commercial value has been found outside of Charleston hill, where the Stall lease was situated. Scarcely enough work has been done in the mine to determine the actual geological conditions with certainty. A north-south break traverses the property its entire length and has been traced for several miles in the adjacent claims. This break has every indication of being a faulting plane —heavy gouge, crushed quartz, and country rock, smooth boulders embedded in the clay, and striations on the wall. All of the Stall lease workings are in this fault plane, and all of the high-grade ore extracted up to the present time, with the exceptions noted later, has been in the form of smooth boulders and pebbles or in crushed quartz. The rocks vary in size, from a pin-head to pieces weighing 150 lb. When small they are scattered throughout the gouge and crushed quartz near the wall or fault plane and make from a foot to 18 inches of mill ore assaying from ten dollars to several thousand per ton. This mill ore is, however, confined strictly to the high-grade shoot, and is necessarily limited in amount. The fault plane, starting with a dip of 49° at the surface, gradually straightens until at the 400-ft. level the dip is 80°. The east side of this break is a highly silicified rhyolite and the west side, where the ore occurs, is andesite. There is every indication that the west side has been raised, but just how far it is impossible at present to tell on account of the limited amount of development. The andesite belt is apparently not over 300 ft. wide, and directly west of it is a diorite dike, not more than 100 ft. thick. Farther west, the rhyolite appears again lying over the diorite. Basalt dikes cut through both the andesite and the rhyolite, with a general north-south trend, but I do not believe they have any relation to the ore

deposition. It was originally believed that this main break was a contact fissure in which the ore was formed and afterward broken and displaced by a general faulting movement, and still later slightly re-cemented in places by a later solution. Development has tended to disprove this theory and the present indications are that the ore was derived from a vein in the andesite striking S. 20° E. This vein is one of a series of parallel veins cut and displaced by the fault. All of these veins do not carry ore of commercial value, although it is possible that high grade ore will be found in some of the others. If this contention of a general faulting plane is true, and now it appears to be the only reasonable explanation, then all the ore mined up to the present time is simple 'drag' from this main vein and the fault has broken through and displaced the ore from a phenomenally rich ore-shoot. No ore has been cut by the fault, although a drift was run several hundred feet south. It is quite possible that there are parallel veins carrying ore of value farther south, and a number of lessees are working in that vicinity with this idea in mind.

Some work was done on this main vein, and a few pounds of ore of the same phenomenal richness taken out, but on account of the limited hoisting facilities and the appearance of so much high-grade ore in the faulting plane lower down, work was discontinued later. Several thousand feet of work has been done by the National Mining Co. on this fault plane north of the Stall lease, but up to the present time no ore of any kind has been found beyond a point 50 ft. north of the lease boundary. Quite recently on the Hyde lease, in a block of ground about 1500 ft. north of the Stall lease some of the high-grade was found in one of the parallel veins in the andesite. This may lead to another bonanza deposit. At the Stall lease, while operating, 75 men were employed. It was equipped with a 25-hp. Fairbanks gasoline hoist, a 1600-lb. skip, a No. 4 Buffalo exhaust fan, and a complete high-grade plant. A change-room, with lockers and wash-rooms, was provided for the miners, and a complete change of outside garments required.

The high-grade ore, assaying over $20 per lb., was taken out in sacks to the mill, crushed in a small Blake crusher to ½-in. mesh, then re-crushed in a small laboratory crusher to ¼-in. mesh. From this crusher it passed to a No. 2 cone-grinder and finally to a Braun disc-grinder, where it was pulverized to pass a 60-mesh screen. The pulp was then put into a 4-ft. pan-arrastre with the proper amount of quicksilver and water and amalgamated for six hours. About 150 lb. of ore was run to a charge and four charges in 24 hours. An extraction of 98 to 99.5% was made by the process and the tailing shipped to the smelter. About $650,000 in bullion was turned out of this little mill in less than three months. Besides the high grade ore three other grades were made: seconds, assaying from $2 to $6 per lb., high grade mill ore $100 to $1000 per ton, and low grade mill ore, anything assaying over $8 per ton and too low grade for other classes. The last three grades were placed in bins or on dumps until such time as other means of reduction could be obtained.

At the present time, the centre of activity in the district is on Charleston hill, and a number of lessees are working on the National Mining Co.'s property and on adjacent claims both north and south. Among the more prominent properties being developed in this way are the National Consolidated, the First National, the Charleston Hill Mining Co., and the Mayflower. A mile from Charleston hill, in the suburbs of town, the Radiator group is being developed under bond by Seattle capitalists. All of these different places will be watched with interest, as a discovery in a new place will mean much to the camp and possibly may cause another of Nevada's booms.

Stall Lease, National, Nevada.

Much of the knowledge regarding the flow of water in pipes to which engineers are today indebted is the result of extensive and expensive experiments made in Europe. Darcy, the noted French engineer, about 60 years ago, after studying the flow of water in pipes under pressure, extended his observations to the flow of water in open conduits, and to this end had built a channel nearly 2000 ft. long, and 80 in. wide. This channel was lined successively with various materials possessing differing degrees of roughness: the cross-section was given different forms, and the bottom varying degrees of slope, with a view to ascertaining the results of these changes on the flow of water through the channel. From the observations made at that time Darcy wrote his formula. This work was taken up by Bazin after the death of Darcy, and the experiments were continued on the same elaborate scale. In California, Hamilton Smith carefully gauged the discharge of water from riveted pipes of various sizes under varying heads, and the results of this line of investigation is considered as of equal importance with the Darcy and Bazin investigations and as reliable.

A Japanese Mining Exhibit

By Reiji Kanda

At the Japan-British Exhibition held at Sheperd Bush, London, this fall, the displays made by the mining and metallurgical companies of Japan were particularly good. Collectively they afforded an excellent picture of the present development of the mining industry in the Island Empire. Among the more important exhibits the following may be described.

In the exhibit of Chobei Tanaka, the predominating feature was the excellent display of cast-iron pipe, mild steel rods, bars, angles, pig iron, iron ores, and manganese ore. The exhibit represents the outcome of twenty-five years' hard work on the part of Mr. Tanaka and his assistants, and the difficulties to be overcome were almost insurmountable. The firm has a large business in the shipment of pig iron, cast steel, and cast-iron pipe. It owns the Kamaishi Iron & Steel Works on the Kamaishi harbor in the Province of Rikuchu, and branch works at Kurihashi, about sixteen miles from Kamaishi. It also owns and works several mines in the district and has a fleet of five steamers. The operations of the firm now cover also the smelting and export of copper, although it is only recently that this branch of the business has begun to pay. The annual value of the products of the company is about $855,000.

Mitsui & Co., Ltd., a firm of world-wide reputation, had the largest and most representative exhibit in the whole section. In addition to fine samples of refined bismuth, pig lead, coal, coke, and sulphur, there was a panoramic model of the new Miike harbor and large scale working models of Miike patent skip-loaders. These loaders, which were constructed by Head, Wrightson & Co., to the designs of the engineering staff of Mitsui & Co., are unique, and are capable of loading steamers at the rate of 500 tons per hour on each loader. Two are now at work and another is in course of construction. The loading of the skip and its discharge into the vessel take but a few minutes, and the result is that the cars are practically always on the move. As there is always a good depth of water in the harbor and entrance, Mitsui & Co. anticipate making this place a large commercial port as well as a coaling base. Some wonderfully good photographic views of the harbor and coal mines were shown. The amount of coal annually turned out by this company is valued at $5,710,000.

The great firm of Mitsu Bishi, which is about the largest and richest concern in the Japanese Empire, had a fine exhibit which included gold, silver, copper, coal, and other minerals. The samples of electro-refined gold and silver were especially worthy of notice, and the various grades of copper, both in the raw and manufactured stages, were excellent. Mitsu Bishi also sent over a sectional model of the famous Takashima coal mine, which showed the geological formations and the various levels under the sea. The coal from this mine is of good quality and is mostly supplied to the Japanese Navy. There were also views of various mines and refineries. The value of the products of both the coal and metal mines of Mitsu Bishi is $5,274,000 annually. The Furukawa Mining Co. had a good display of raw and manufactured copper and of various by-products therefrom. It also showed a relief model of the famous Kune copper mine. The annual value of this company's output is estimated to be about $4,370,000 and this concern, with the Mitsu Bishi Co., may be considered the pioneers of Japanese mining.

K. Sumitomo represents a family that has successfully worked the famous Besshi copper mine for over 200 years, and as the resources of this mine are apparently inexhaustible, a prosperous future is anticipated. Mr. Sumitomo had on exhibition a beautiful model of the Shisakajima smelting works. This plant is one of the most modern in the Japanese Empire. In addition to mining and smelting copper ore and the manufacture of copper and brass tubes, rods, sheets, and cables, Mr. Sumitomo does a large business in steel making and casting, and exhibited fine specimens of work of this class. Mr. Sumitomo's annual production of copper is valued at $1,840,000.

A glimpse at the exhibit of the Nippon Oil Co., Ltd., would have convinced the visitor that the various classes of illuminating and lubricating oils made are of high quality. The crude oil shown was from several different leases in the Echigo district and the specific gravity varied from 0.7919 to 0.9253. The gasoline refined from these samples is of specially good quality, both for engine and stove purposes, and the various lubricating oils shown compete with any in the world. The paid-up capital of the company is now $5,000,000; it gives employment to about 3300 people, and the area developed is about 6500 acres. When it is stated that the average dividend amounts to 25% per annum, it will be understood what a flourishing concern this is. The Nugata Iron Works Co., which is operated by the directors of the Nippon Oil Co., Ltd., showed heavy well-boring appliances, including their patent 'Shokudai' (or candle-stick) pipe-recovering implement. This receives its name from its resemblance to a *shokudai* or Japanese candle-stick. It is used for recovering casing and is successfully and easily operated.

F. Kuhara had a representative exhibit of the various ores and copper products from his Hitachi mine. This mine, which is situated in the Province of Hitachi, has been known for 200 years and is now classed as one of the four great copper mines in the Japanese Empire. It was originally opened by members of the Satake clan, but has, since its inception, had several owners. It came under the present management in 1905, and since then enormous progress has been made. The method of prospecting and exploration is by boring with Calyx drills. Large and small cores were shown. There is still a great area to be exploited, and it is anticipated that the present annual output, which is valued at $555,000, will be greatly increased in the near future by further exploration. The Fujita company, of which the head office is situated in the city of Osaka, has a large business which covers mining, agriculture, and forestry. It is one of the largest priyate concerns in

Japan and was started in 1864 by Denzaburo Fujita who is still its president and is assisted by his son Heitaro Fujita as vice-president. The Kosaka mine of which a large model was exhibited is operated by this company. This mine was discovered in 1861 and until 1897 was worked for silver. A new process was then found which made it possible to extract copper from the complex sulphide ore, which hitherto owing to its low grade, could not be worked profitably. The Fujita company commenced to work this metal principally, with the result that an abundant supply has been obtained since, together with gold and silver of no less value, though the latter exists in a very small percentage in the ore. Lead also is recovered. Some years ago metallic zinc was produced experimentally at the Kosaka mine to determine which could be produced more economically, copper or zinc. The verdict was in favor of copper and for the time being zinc is not being taken from the Kosaka mine, although experiments are now in progress with a view to extracting the zinc from the copper slag. The Fujita company also owns and works the Zuiho and Omori gold mines. The samples of gold and silver ingots, electrolytic copper, pig lead, and various ores obtained from all the mines were striking. There was also a chart showing the processes and products of the Kosaka mine from the time the ore is mined until the metal reaches the market. The annual output of the Fujita company is valued at $3,170,000.

The Hokkaido Colliery & Steamship Co., Ltd. (Hokkaido Tanko Kisen Kabushiki Kwaisha) is a large company in the northern coal district. This company is concerned (in conjunction with Armstrong, Whitworth & Co., and Vickers, Son & Maxim) in the construction of war supplies and the manufacture of steel. It has blast-furnaces and other plant at Mororan. Mororan, Otaru, and Hakodate are the open ports on the island of Hokkaido, and this company has coal sheds and loading plants at each. It does a large business in bunker coal and this trade is rapidly increasing. The value of the coal produced last year amounted to $3,165,000. A large lumber and general timber business is carried on profitably as side business. The Imperial Steel Works of Japan showed a large case of polished sections of mild steel joists, girders, bars, and some turned steel locomotive tires of three different diameters. They also showed furnace brick made from chamotte, silica, chromite (for Martin's furnace), and fire brick from agalmatolite. This is the only exhibit in this section which showed materials of this class. The firm also had on view manganese ore, magnetite, magnetite changed to hematite, dolomite, and limonite. The works have by-product coke ovens and recover coal tar, oil, pitch, and ammonia. The Association of Colliery Owners in the Province of Chikuzen and Buzen represents practically the whole of the mine owners in these two provinces, and their output of coal is more than 60% of the entire production of the Japanese Empire. Under the management of the Association the progress made in late years has been rapid. The exhibit comprised fine specimens of coal from the various mines. The coal is hard and is largely used for naval and railway purposes. There was also shown natural coke which has been formed by the intrusion of volcanic rock. This natural coke or *sawaki* as it is locally called, is found only in a few places in Japan, but is valuable owing to its high calorific power.

The Imperial Geological Survey Department had a large and representative exhibit comprising about 350 specimens. These included, among the minerals, samples of native elements, sulphides, silicates, tellurides, sulpho-salts, haloids, oxides, carbonates, niobates, tantalates, phosphates, sulphates, tungstates, and hydro-carbon compounds. There was a specimen of every kind of rock found in Japan. A large and varied assortment of fossils was shown, some being both wonderful and rare. The crystals of various kinds on view were especially fine, and many of them appeared to be new. There were also two large maps of the Japanese Empire (with the Korean peninsula), one showing the geological formations and the other the important mines. The maps were each 21 ft. square and every detail was easily and clearly understood. The Bureau of Mines sent over some models that represented the output and value of the various minerals at different periods. The descriptions indicated how marvelous has been the growth of the industry since 1880. The articles represented were coal (illustrated by miners of different heights), gold, silver, copper, and iron (by different sized ingots), and oils (by storage tanks). There were large charts showing the annual imports and exports of various minerals, the licenses granted for their production, and deaths and accidents in the mines.

The Yamato Metal Co., of Tokio, had an exhibit of their antifriction metal. This metal is in great demand throughout Japan. It is made of various mixtures of selected brands and in seven different degrees of hardness to meet all requirements. The Higher Technological schools of Tokio and Osaka have experimented with this metal extensively and some splendid results have been obtained. It has also taken medals and prizes in the various exhibitions and shows in Japan. The Yoshinotani Coal Mining Co., Ltd., (whose European agent is S. Samuel & Co., Ltd., of London) exports a large amount of coal for commercial purposes to Chinese ports and supplies about 30,000 tons of bunker coal annually to ocean-going vessels in Far Eastern waters. This company also owns and works the Yusenji copper mine. Considering that this mine was not opened until 1902 the production last year of about 700 tons of copper ingots is a very good result. The exhibit by the Yoshinotani company comprises coal (in block form), chalcopyrite, and copper ingots. The Kaijima Mining Co. and Yasukawa & Matsumoto are the largest independent colliery owners outside the Association in the provinces of Chikuzen and Buzen. Each of these companies has a number of well equipped mines with total outputs amounting to $2,635,000 and $1,285,000 respectively. These companies exhibited a number of samples of coal from seams of varying thicknesses together with very good specimens of oven coke.

Mining in the San Juan—I

By William H. Storms

On August 23 I left San Francisco on the Western Pacific railroad, by way of Salt Lake, for a visit to some of the mining districts of Colorado. I took the second regular passenger train leaving Oakland on the new road, returning by the same route October 20. The Western Pacific passes through an interesting country, including the picturesque canyon of the Feather river, in California; Lake Lahontan, a large ancient Tertiary dry lake in Nevada and the scenic region of eastern Nevada and western Utah. The road is splendidly equipped, the service excellent, and a trip over the newest transcontinental railroad is a real pleasure.

Business conditions throughout the country, whether good or bad, usually find a decided reflex in the mining regions but it may be said that in the San Juan mining districts of southwestern Colorado the present status of the mining industry is largely due to other causes than to the condition of business generally throughout the country. From this statement it must not be concluded that the industry is stagnant in the San Juan. By no means. Nearly all of the larger mines—those which have made that region famous—are still in successful operation and there are a number of new enterprises, which promise a great future, that have only fairly started upon their careers for better or for worse.

My recent visit was the first I had ever been able to make to that noted region, and as usual, notwithstanding the numerous descriptive and illustrated technical and popular articles I had read of the San Juan, I found that there were many things which, to be appreciated, must be seen. No description, it seems to me, can give an adequate idea of the grandeur of those mountains, and photographs, in most instances, fail to give the perspective which will carry a proper idea of their towering heights, while the combination of colors is wholly lost.

Ouray is a good sized town picturesquely situated in the canyon of the Uncompahgre river; almost completely surrounded by vertical cliffs of red and buff sandstone and limestone, which rise a thousand feet or more from the steep talus at the base. From the top of the first scarp of red sandstone, the rocks slope steeply upward to a second line of cliffs, buff, gray, and red in color which add another thousand feet or more to the height of the mountains. Above this is piled layer on layer of dull gray conglomerate, tuff, and massive lava to a height of 2000 to 3000 ft. more, making a total of 5000 ft. or over from the bottom of the canyon to the summit of the ragged sky line. These magnificent mountains present many phases of light and shade with colors brilliant or sombre, according to the conditions of atmosphere, sunshine, and the shadows of clouds. In a hot midsummer day the rocks take on a metallic glare, trying to the eyes and unimpressive, except as to their height. One day in the latter part of last August I stood on the Camp Bird road near the Mineral Farm mine. A heavy thunder shower had just passed and thousands of cascades were leaping down the cliffs on all sides, the rapid run-off swelling the streams in the canyons into raging torrents. The sun was shining through the clouds upon a huge mass of eruptive rock near the Bright Diamond mine, on Gold hill, just beyond Ouray, and the rocks which an hour before had been dull and uninteresting, were now magnificent in the rich color effects produced by the sunlight streaming through the clouds. I only saw one other sight which to my mind surpassed it, when the following day I rode up the canyon of the Uncompahgre, about three miles from Ouray on the road to Silverton. Again the heavy rain clouds had spread like a blanket over the mountains about me, but to the southward in the vicinity of the Red mountains the sun shone brightly. Words cannot describe the gorgeousness of that scene. The mountains were aflame with color. Rich crimson, bright scarlet, dull red, and orange predominated, which the isolated areas of olive green, chocolate, violet, and black set off to wonderful advantage. Mount Abrams on the left is sombre gray on one side, with streaks of gleaming snow near its summit, and Mount Hayden, dark and frowning, on the other, formed a magnificent frame for the splendid picture beyond. A friend of mine endeavored to describe Red mountain to me. He said, "it looks as though some fellow had climbed up there with several barrels of red paint of various shades, and then amused himself by pouring it out on the summit of the mountain allowing it to run at will down the sides of the mountain." I do not believe I can improve upon his description.

On reaching Ouray, one naturally expects to see mines, and is surprised that none is in evidence. Inquiry of the citizens leads to the stranger being directed to scan the summits of those awful cliffs, and there, amid the 'rough and rugged rocks,' 1300 to 2000 ft. above the canyon bed he can with difficulty discern the buildings, looking much like the rocks themselves. The American Nettie, famous these many years as a great gold producer, and a mine of large possibilities yet, is situated high up among those crags nearly half a mile above the town. On a bench 700 ft. lower, the Bright Diamond mine buildings can be seen clinging desperately to the edge of the ragged cliff.

"How do you get up there?" I asked. "By the trail, on horseback," was the answer.

I made the trip, and am free to say a nervous person had better remain down in the village.

The Bright Diamond mine is situated 700 to 800 ft. lower than the American Nettie, and like the latter the ore deposits are found in quartzite, the mineralization occurring at no less than five geological horizons in beds over 100 ft. in thickness. This property is being operated by the Wanakah Mining Co. of Ouray. G. H. Barnhart is manager, and Mr. Roberts, superintendent. The principal development in what is locally called the 'lower contact' is on the Iron-Clad and Finance claims. On the 'upper contact' the openings are on the Bright Diamond claim. The orebodies lie approximately horizontal and extend into the mountain, gaining depth rapidly.

The escarpment of the American Nettie quartzite is from 1400 to 2000 ft. farther east than that of the Bright Diamond Iron Clad group and the workings of the American Nettie extend more than 3000 ft. into the mountain or 4400 to 5000 ft. easterly of the outcrop of the Wanakah company's mines. There seems to be no reason why mineralization on these lower ore bearing strata should not extend back into the hill at least as far as in the American Nettie above. This, however, remains to be proved by actual development. In addition to the flat sheets of ore there is in these workings a vertical vein, occupying a fissure in the strata and called the Memphis. It is from one to five feet wide and carries sulphide ore similar to that in the flat deposits. A nearly vertical dike of andesite cuts the sedimentary formations about 200 ft. northerly of the Memphis vein, which in places is accompanied by ore. This dike crosses the canyon of the Uncompahgre, and can be seen cleaving the cliffs for 3000 ft. or more in height. It is known as the Memphis dike, and is thought to have influenced mineralization in the quartzites. Faults are not uncommon in these mines, and in the vicinity, though in most cases the throw is not great. At one place in the mine workings is what seems to be a continuous bed of ore, about 8 ft. thick which along a vertical line shows evidence of disturbance, the ore being crushed and mixed with country rock. On one side of this break the unmineralized rock is quartzite, on the other a partly altered limestone. This is certainly indicative of faulting. Further development should throw more light on this interesting occurrence, the amount of displacement not having been determined.

American Nettie Mine, Ouray, Colorado.

It is probable that this occurrence affords an illustration of two beds of ore, originally formed at separate horizons, now brought opposite each other by faulting, making them appear to be a single continuous sheet of mineralization. An interesting feature of these deposits, and of the American Nettie as well, is the occurrence of caves in the quartzites along the outcrop, wholly or partly filled with ore. One of these had been discovered a few days prior to my visit and the ore was being removed, little blasting being required. The material filling the cave consisted of a loose, spongy mass of quartz—a skeleton, as it were of an original deposit, presumably of sulphides in a quartz matrix. As oxidized products were found hematite, limonite, wad (a mixture of iron oxide and manganese), lead carbonate and other lead ores, clay, calcite and both green and blue copper carbonate. Vivianite is seen occasionally. Stalactites of aragonite were not uncommon, and the walls and roof in many places were coated with calcium carbonate now being deposited from seeping waters. Copper sulphate was also found on the roof and walls, and saturating the ore beneath in places. Large pieces of the cellular quartz were removed that were generously bespangled with bright flakes of gold, though these required careful handling, for the gold was loose and was dislodged by a slight blow. Scattered irregularly through the heterogeneous mass of mineral were bunches of sulphide ore, which resemble the unaltered mineral in the quartzite, consisting of the sulphides of iron, lead, copper, and zinc, with gold and silver. Occasionally magnetite is found mingled with the sulphide ores. The horizontal deposits range from a few inches to 8 or 10 ft. in thickness, but are very irregular as to outline, though having a general trend southeasterly into the hill. The sedimentary beds roll somewhat—taking a decided dip along one edge of the deposit, but it is probable that mineralization will be found to continue beyond the roll, along the axis of which the rocks are more dense and show little sign of fracture or crushing—conditions essential to the formation of ore in all such deposits. The Wanakah company has leased the American Nettie stamp-mill situated near the river side of the canyon and was giving it a thorough overhauling. A new aerial tramway had just been completed, and a few buckets of ore had been sent down. Next to a flight in a modern aeroplane a trip in a steel bucket on one of these aerial rope ways of the San Juan should be the most satisfying to those having ambitions in the way of aerial navigation. The Bright Diamond tramway is 2700 ft. long and descends about 1300 ft. vertically. There are but two towers, each near the upper terminal, and none between these and the mill. At one point the

bucket swings fully 900 ft. above the canyon bottom. The ore is to be concentrated in the mill when repairs are completed, and very satisfactory results are anticipated.

The American Nettie mine I did not visit as only a few lessees are at work under direction of Frederick O. Seaberg, of Ouray, who told me he considered his prospect of discovering valuable orebodies from present indications as particularly good. There are over 12 miles of workings in this mine, and it has been frequently described by various technical writers, among them T. A. Rickard, in his book, 'Across the San Juan Mountains.' Several million dollars have been taken from these mines of Gold hill, and the deposits are still far from being exhausted though the problem presented today is the economical handling of the large amount of low-grade sulphide ore available in the numerous claims.

About four miles northeast of Ouray is the Caliope mine, one of several on the quartzite that has given fame to this district. The mine is under the management of Carl Sigfried. In the latter part of September it was about ready to make a shipment of ore which was said to carry $8 gold and several ounces silver per ton.

While at Ouray my attention was attracted to several unusual matters. Among them was the four-horse stage which leaves every morning for Silverton. This stage carries passengers and baggage—particularly the latter. The baggage is comfortably arranged and the passengers dispose themselves as best they may. One morning the stage drew up in front of the hotel Beaumont to take on passengers. In front on the foot-board, beneath the driver's seat, was a 50-lb. box of dynamite. A man on the sidewalk who had engaged passage eyed in alarm the label on the box: 'Hercules—40% nitro-glycerine. Explosive—Dangerous.'

"You ain't going to take that powder in the stage?,' he gasped.

"Sure," replied the driver. "The end that explodes—the dangerous end—has been cut off, else I wouldn't pack it, you can bet on that."

This explanation seemed satisfactory, for the man took his seat in the stage with the other passengers, and reached Silverton in safety that afternoon.

In former years there were two smelters down the canyon from Ouray but neither has been in operation for many years. At the site of one of them nothing remains but the slag dump. The ores of the district are sulphide and silicious. Limestone is abundant, and if the smelters could get sufficient ore of their own selection from the mines there seems no reason why smelting cannot be successfully accomplished at Ouray, but the earlier plants evidently had difficulty in getting suitable fluxing mixtures, which with the close competition of those days, made the business unprofitable. Notwithstanding this, there is again talk of organizing a company to build a smelter near Ouray to treat the ores of the surrounding region.

Just south of the town are a number of hot springs which discharge a large volume of scalding water. These springs mostly issue along the line of an east-west fault which has brought the Algonkian rocks up opposite the Carboniferous sandstones. This fault can be traced many thousand feet and at places contains a little ore, but thus far very little ore has been found in any of the fissures occurring in the hard, dense quartzites of those ancient crystalline rocks. There are two other faults approximately parallel with that just mentioned, which have a throw of 50 to 200 ft. Both of them are of some importance where they cross the Mineral Farm property, as the orebodies developed there may possibly be repeated by faulting. The extensions have not been found as yet, no prospecting having been done for them. There is still much opportunity for the prospector about Ouray.

NEW YORK'S WATER PROJECT

The most stupendous municipal water-supply system in the world is that which will eventually supply New York City with water for domestic and other purposes. The magnitude of this engineering project places the largest of Western mining operations, by comparison, in the light of very ordinary affairs. Concerning it, the *Engineering Record*, referring to a recent engineering report to the municipal authorities, says: The Hudson river crossing of the Catskill aqueduct has involved subsurface explorations of such an extensive and difficult character that the detailed account of this portion of the Board of Water Supply's work by Mr. Dodge and Mr. Hoke, not only should prove of great value to others engaged in similar undertakings, but also should be of interest to the engineering profession as a whole, for it records the methods used in determining the location and depth of the deepest inverted water works siphon in the world. After certain preliminary investigations had been made at a number of different points the location for the aqueduct crossing under the Hudson river was fixed at the point where the river narrows in the gorge between Storm King and Breakneck mountains, for at this place the rock was found to be sound granitic gneiss, admirably suited to tunneling. It remained, therefore, to find out how deep the proposed tunnel would have to be driven to remain in sound rock for its entire length and have over it a rock cover of at least 150 ft. This information was obtained by wash borings, by vertical diamond-drill borings put down from scows in the river, and by long inclined diamond borings started from chambers in test shafts about 300 ft. below ground. The longest inclined hole had a length of over 2000 ft.; holes of such depth are unique in this portion of the country, although deeper borings have been made in the Lake Superior copper region and in the South African mining fields. At the Hudson river crossing of the Catskill aqueduct the ledge rock shelves off steeply from both shores, forming a deep notch which is believed to have been gouged out by the action of the ice during the glacial period. This gorge has subsequently been filled in with glacial drift, consisting of sand, gravel, and boulders, the latter often reaching 10 ft. or more in size.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

Iron and steel when embedded in concrete do not rust, as the air is excluded from contact with the surface of the metal.

Sand-lime bricks are made of 10 parts sand and 1 part lime, enough water being added to make a thick mortar. This mixture is placed in molds and heated by steam under pressure.

Total visible copper supply on September 1, 1910, according to the semi-monthly circular of James Lewis & Son of Liverpool, was 97,506 tons. This by October 3 had been reduced to 93,961 tons.

Laws relative to the location, possession, and use of water are not as clearly defined as is desirable. The law takes cognizance of water that flows beneath the surface as well as that upon it.

Unpatented mining claims have been held by the courts to be 'real property' in the strictest sense of the law, and being such are subject to assessment and taxation, and may be sold for taxes or under judgment for other debts.

Metallic mercury in tailing is said by some cyanide operators to be an advantage in treatment. In other forms than metallic, however, its presence is less desirable. Silver-mill and patio tailing contains mercury in various altered forms, principally as chloride.

Steel for car wheels is limited to the following as to chemical composition, according to 'Standard Specifications' of the Carnegie Steel Co.: carbon 0.65 to 0.85%; manganese, 0.60 to 0.85; silicon, 0.08 to 0.25; phosphorus, not to exceed 0.05; sulphur, not to exceed 0.05.

Flint pebbles are used instead of steel balls in tube-mills where the fine metallic particles due to attrition would be a disadvantage in treatment of the pulp by cyanidation. Where roasting precedes cyanide treatment all iron particles are reduced to oxide and are harmless.

Flash-light photographs, particularly when taken underground, to be successful should have as much light as possible. It is advisable therefore to use a liberal quantity of flash-light powder, or several strips of magnesium tape, otherwise the exposure is likely to be disappointing and much valuable time lost.

Antimony is quoted in New York at 12 to 12¾c. per pound. The reduction of antimony ore is not a simple process. It requires furnaces of particular construction, and it is unlikely that the prospector owning a vein producing antimony sulphide or other ore of the metal would make a metallurgical success of the undertaking, to say nothing of commercial profit.

The strike and dip of veins are governed by no known law, nor does the pitch or trend of an ore-shoot bear any relation to its direction of dip. There are many who say an ore-shoot will be found to dip to the right when standing on the apex of the vein facing in the direction of dip. This is a fallacy, as ore-shoots may trend either right or left along the plane of the vein, and are frequently known to dip in different directions at various points.

Inspection of a steam-boiler is a matter of importance. When notified to prepare a boiler for internal inspection, proceed to cool down and clean the boiler. Remove all scale, clean out the ashes and soot on the grates and in the combustion-chambers, and sweep off the plates, heads, and tubes, so that every part of the boiler may be examined and its exact condition determined. Have the boiler cold for the inspector when he arrives. Have the steam-gauge ready for testing, water-column connections open for inspection, and everything in readiness to facilitate a thorough inspection of the boiler and all its connections.

Where an association of eight men locate a placer claim of 160 acres, the law requires the performance of $100 worth of work, or a like amount in machinery or improvements on the property each year after that in which the location is made. As oil lands are subject to entry as placers, this law of annual labor must apply to such oil locations. The law requires annual labor, or improvements, on each claim, but does not specify the size of the claim, therefore the holder of a 20-acre claim or of a fractional claim of less than half that area is required to expend $100 annually on his claim, regardless of its size, and a claim of 160 acres requires no more than a small one.

Failure to perform the annual assessment work on an unpatented mining claim is construed by the law as equivalent to abandonment, and the claim then becomes subject to re-location by any person, a citizen of the United States. If A neglected to do the annual work on his claim in 1906-7, B had a legal right to re-locate the claim in 1908. A's procedure of serving papers on B commanding B to cease work on the claim should have been taken into court, as A had no legal right to command B to stop work. Any work done by B could not be considered as having been done by A, unless A paid for the work. A's only credit was the four days' work done by himself. If in 1909, while A and B were wrangling over the location, insufficient annual work was done on the claim, any third party—C—was legally entitled to locate the claim for himself. If the 'papers' served on B at the instance of A were in the nature of an order of court, B's title would remain unchanged pending a settlement of the matter in court, but as B failed to defend his title to the claim, C had the right to proceed and take legal possession of the property by re-location. B may have a just cause of action against A, who caused him to cease work and thus lose his title to the claim. Better consult a lawyer.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Avino Mines Company

The Editor:

Sir—In your issue of October 8 I notice in the London letter reference to the Avino Mines of Mexico, Ltd. From the remarks therein one is apt to obtain a wrong impression of the part played by the engineers referred to, A. A. Blow and myself. The property was worked by the Mexicans for several hundred years before it was sold to F. L. Gardner and associates, and a fabulous amount of silver was extracted from the upper workings. Most of the ore taken from the mine under Mexican control was obtained from open-cut work, from the surface down to a depth of 500 ft. Judging from the size of the open-cuts hundreds of thousands of tons must have been extracted. The open-cuts, over 200 ft. in length and, in some places, over 300 wide, would indicate an enormous tonnage. The ore taken from these workings was treated by pan-amalgamation and in patios and was a dry silver ore containing some gold. At the time this property was taken over by Mr. Gardner and others the workings were in sulphide ore, showing two shoots—one of lead and the other of copper ore. These shoots were so thoroughly defined that it was a simple matter to mine the two classes of ore separately, though concentration was required, if a complete extraction was to be considered. I understand this was suggested by Mr. Blow, who was at the time acting as consulting engineer. A concentrating plant was installed and operated for some time. This gave some good results, but the average results were unsatisfactory. I cannot give the reasons for this, but think the poor results were due partly to the inefficiency of the machinery used and, possibly, to the mixture of the different ores going to the mill. There is little data available now to put one in a position to analyze what was done, but I am satisfied that had Mr. Blow's suggestion been carried out carefully the results obtained would have been different. At a later date the concentration plant was thrown out and a lixiviation plant was installed and operated for a considerable time. From the data available and results secured, I judge that this process proved anything but successful. After a series of failures and with depleted funds for operating the property, I undertook its resurrection. In order to do this, I suggested that the then small capital be used to develop the mine laterally and in depth before determining on a method of treatment and all of my earlier efforts were devoted to the development of ore reserves. In the course of this work I was able to ship several thousand tons of copper ore, which netted a nice profit over cost of extraction and furnished about the first profit received from the property. This was after the best ore had been mined and the stopes had been picked over by the previous managements. The ore shipped during the time I acted as manager was taken largely from new development work. After opening up over 100,000 tons of ore and our funds again becoming nearly exhausted, the method of treatment was again taken up. At this time I suggested water concentration, but it was thought advisable to look about for a better method of concentration and after testing a considerable amount of the ore by the Elmore Oil Vacuum process it was decided to give it a thorough trial. An Elmore machine was installed and the ore was thoroughly tested, first with oil, then with oil and acid, and finally by heating the pulp, but the results were, one and all, eminently unsatisfactory. I then tried to persuade the directors to allow me to ship a quantity of ore to H. E. Woods, of Denver, to thoroughly test it by water concentration, but could not get them to agree to this course and I severed my connection with the company. Immediately after that my suggestion was adopted and the ore was sent to Mr. Woods—who tested it without representatives of the company being present—and upon his recommendation an experimental plant was installed some two years ago, so that by now the company should be fairly out of the experimental stage, although this is not indicated by the London letter in question, and it is there suggested that further experiments are advisable.

RALPH NICHOLS.

Gilmore, Idaho, October 21.

Crushing by Stages

The Editor:

Sir—In your issue of July 30 I took exception to Felix Cremer's remarks in regard to the mining fraternity not recognizing the efficiency of the principle of grinding as illustrated in the conical tube-mill. I made some criticism of the principle involved mainly for the purpose of getting accurate data from metallurgists who have the two types of machines, cylindrical and conical, working side by side. The results on which I based my opinion were, as Mr. Cremer suggested, not recorded with sufficient accuracy to preclude errors of judgment and as the two types of machines were not used, no comparison was available. Mr. Cremer has offered no figures nor any mathematical deductions to prove his point.

Then comes Stuart Tod, who supplies concrete figures of an actual comparison of two mills working side by side on the same ore. This is the kind of information that is wanted. The comparative efficiency of the two mills is herein worked out. H. W. Hardinge, the professed parent of his 'baby,' as he calls it, enters into the discussion, October 8, but offers no figures of actual work done. I am surprised at some of the mathematics he has offered. I was unaware that all of the surface of the balls introduced into a tube-mill was effective crushing surface, for I had labored under the delusion that the balls only touched at points, and not over their entire superficial area, which renders Mr. Hardinge's mill '13,000 times' more effective than stamps of a weight equivalent to the weight of balls in his conical mill.

Doubtless Mr. Hardinge has authenticated figures which represent the actual (not theoretical) performance of his mills, and if these were published much needed light would be thrown on the subject. I notice Mr. Hardinge takes exception to Mr. Tod calling his mill a single-cone mill. This is unfortunate, for if the principle involved is correct there should be a central feed and double discharge, as Mr. Abbe has developed his double conical mill. Why? Because if this sizing action is pronounced the tendency must be to keep the fine material at the feed end and to push the coarser material in the opposite direction—forcing this coarse material to that portion of the cone where the crushing efficiency is at its lowest. In other words, the heavy stamp has missed the coarse ore and the light stamp must attempt to do this work at a disadvantage. (Note Mr. Hardinge's comparative illustration of stamps in the tube-mill.) This point is proved by Mr. Tod's figures, 15.1% + 20-mesh, the feed, and 3.5% + 20-mesh, the discharge, showing that 3.5% of the ore passed entirely through the mill without any reduction in size.

I do not agree with Mr. Hardinge that I take the position that the body of his mill "is formed on correct lines." I believe the nearer it approaches the cylindrical, the more effective it would be, but I did suggest in *The Mining World* that provided the sizing action was pronounced, as claimed, that an ellipsoidal-shaped mill would be more effective than the conical because it gave more 'large diameter.' A mill, to be effective, must revolve at a speed proportionate to its diameter, or, as the formula shows, inversely as the square of the diameter, the variation in speed due to load of pebbles, physical quality of ore, etc., being secondary. A conical tube cannot conform to this condition, because all diameters make a revolution in the same time, but not at the same peripheral speed.

I have recommended two mills or more, and intermediate sizing not, as Mr. Hardinge states, using the same media, but mills of different diameters, different size pebbles, and different speeds. This is a different proposition. To analyze Mr. Tod's figures, it may be supposed that the mean grade of ore remaining on a 20-mesh screen to be that corresponding to the average of the sizes between 10 and 20 mesh, that on a 40-mesh to be an average between 20 and 40, and so on, and that going through 120-mesh as the mean between 120 and 200. The figures will be as fair for one machine as for another. The sizes of the apertures in the different mesh screens may be taken as follows, calculated as in Richards' 'Ore Dressing.'

+ 10 mesh	.....	0.0205 inch
+ 20 "	.....	0.027 "
+ 40 "	.....	0.0115 "
+ 60 "	.....	0.0072 "
+ 80 "	.....	0.0057 "
+ 100 "	.....	0.005 "
+ 120 "	.....	0.004 "
+ 150 "	.....	0.0036 "
+ 200 "	.....	0.003 "

"The problem becomes the mathematical one of determining the relative surface of the grains of pulp before and after passing through the tube-mill, assuming similar shapes and equal weights of all the particles included in each successive grade. Since, for any definite weight of ore the total surface area varies inversely as the diameter, then the relative surface exposed by each grade may be determined by dividing the weight of that grade by the average diameter of the particles in the grade."

COMPARATIVE EFFICIENCY TABLE

Cylindrical Tube

Mesh	Mean grade	Feed %	Feed Relative surface	Issue %	Issue Relative surface
+ 20	..... 0.023	3.1	1.34		
+ 40	..... 0.019	15.5	8.15	3.2	1.63
+ 60	..... 0.009	15.6	17.33	4.5	5.00
+ 80	..... 0.006	14.6	24.33	10.5	17.50
+ 100	..... 0.005	9.6	19.20	15.8	31.60
+ 120	..... 0.0045	2.4	5.33	2.4	5.33
— 120	..... 0.0035	39.2	112.00	63.6	181.71
			187.68		242.77
					187.68
					55.09

Conical Tube

Mesh.	Mean grade.	Feed. %	Feed. Relative surface.	Issue. %	Issue. Relative surface.
+ 20	..... 0.023	15.1	6.56	3.5	1.51
+ 40	..... 0.019	55.6	18.78	21.2	11.15
+ 60	..... 0.009	10.4	11.55	14.1	15.66
+ 80	..... 0.006	11.1	18.50	17.9	29.83
+ 100	..... 0.005	6.4	12.80	11.2	22.40
+ 120	..... 0.0045	0.7	1.55	1.6	3.55
— 120	..... 0.0035	20.7	59.14	30.0	87.14
			128.83		171.24
					128.83
					42.41

I have divided the product by 100 to bring the calculations to unity. The relative mechanical efficiency is obtained by dividing the work done by the amount of power used. The cylindrical tube has reduced the surface 55%; the conical tube 42.4%. If the power and tonnage were the same the relative work done would be as 55 to 42, but while the tonnage is the same the power required is different.

Work done, cylindrical, $\frac{55}{30\text{ hp.}}\frac{75}{}=137.5$

Work done, conical, $\frac{42.4}{25\text{ hp.}}\frac{75}{}=127.2$

This shows the relative efficiency of the cylindrical and conical mills as calculated from Mr. Tod's figures of actual work accomplished, to be as 137.5 to 127.2.

ALGERNON DEL MAR.

Fort Bidwell, California, October 15.

COST OF POWER PER HORSE-POWER DAY*

Steam-power, non-condensing engines, coal at $4.50 = 16 — 18 cents.

Condensing engines = 14 — 16 cents.

Compound condensing engines = 11 — 14 cents.

For each $1 increase in cost of coal add $1\frac{1}{2}$, $1\frac{1}{4}$, and 1c. respectively.

Electric-power, $40 — $65 per yearly horse-power = 11 — 18 cents.

*J. A. Barr, 'Testing for Metallurgical Processes.'

Special Correspondence

PITTSBURG, PENNSYLVANIA

First Mine-Rescue Car Arrives.—Men Being Trained.—Illinois Stations Rushed to Completion.—First Aid Work.

Mine-Rescue Car No. 1 of the U. S. Bureau of Mines was delivered at the Pittsburg station recently, where it will be completely fitted for emergency calls and systematic training in rescue methods and first-aid relief. This is an indication of the efforts being made by the Bureau under recent legislation. The maiden trip was the occasion for bringing to Pittsburg the Illinois men who are in training for positions at the three State stations now under construction. On arrival of the car at Urbana station it was inspected by State mine inspectors and members of the State commission for mine rescue work. It is a re-built Pullman, with berths and arrangements for meals for ten men, including the two in charge. One-half of the car has clear floor-space for equipment and for demonstration work, but has upper berths which are lowered for use at night or as temporary hospital quarters. Similar cars will probably

Mine Rescue Car, U. S. Bureau of Mines.

be purchased by the State of Illinois for auxiliary work. The car was in charge of R. Y. Williams, mining engineer, and J. M. Webb, foreman of the Urbana station. F. W. DeWolf, State geologist, accompanied the party, which included the following men who have completed preliminary training at Urbana: Charles Swan, G. H. Walmsley, Peter Donnelly, J. C. Duncan, Frank Rosbottom, and Thomas English. These men are in training for places in Illinois stations as superintendents and assistants. Three State stations to cost $11,000 are being built. It is hoped they will be finished and equipped January 1, 1911. On arrival at Pittsburg the men joined the Federal corps and other miners from Pennsylvania, Alabama, Indiana, and elsewhere, assembled for instruction in rescue work or engaged in the scope of the investigations under way at the Pittsburg station. Dr. Shields, well known for his efficient work in organizing and training first-aid corps in the anthracite region, was present and gave daily instruction and demonstrations of methods. His corps of six men served as a stimulus to others in training. The complete course of training will require a week or ten days. At the close of the meeting it is expected that the men will scatter to various Federal and State stations to spread the benefits which follow systematic rescue and first-aid instruction. Other special cars—six in all—will be delivered at once, and buildings at various sub-stations will be rushed to completion as soon as possible in order to guard against the mine accidents which usually are more numerous and serious during autumn and winter months. Illinois is the first State to take up the work independently. It will there be in charge of a commission, which has recently selected Richard Newsome, of Peoria, as general superintendent.

BULAWAYO, SOUTH AFRICA

Important Consolidation of Rhodesian Mining Properties.—Geological Survey for Southern Rhodesia.—New Companies.

One of the most important projects that has ever been launched in connection with Rhodesian mining is now being arranged in London, and by this time it should be completely arranged. The scheme in question is the formation of a Rhodesian trust company which will control the fortunes of a number of important mining and financial undertakings; will finance these concerns, and advance the development of the several mines. The new company, which will in reality be a reconstruction of the Rhodesian Exploration & Development Co., will have cash in hand to the amount of over £4,000,000, and should prove a 'tower of strength' to mining enterprise in Rhodesia and likewise greatly increase the stability of the industry. It is proposed to increase the capital of the Rhodesia Exploration & Development Co. from £450,000 in £1 shares (of which 350,000 are in issue) to £2,000,000 and to acquire the whole of the interests at present held by the Rhodesian Banket Co., the Rhodesian Abercorn Shamva Trust Co., the Etna Development Co., the Gold Schists of Rhodesia, Ltd., the London & Johannesburg Trust Co., the London & Johannesburg Syndicate, and the French S. A. Development Syndicate, Ltd. These companies will receive between them 1,407,299 shares in the new trust and the allocation of the remaining capital will be as follows: 300,000 shares will be offered to shareholders in the above mentioned companies and syndicates at 45s. per share. These have all been guaranteed by Abe Bailey, the moving spirit in the new enterprise. The remaining 292,771 shares will be held in reserve. The chief objective of this re-shuffling of the cards is to provide ample funds for the development of the several important mines concerned in the reconstruction. The blocking out of further reserves of ore is an urgent need in Rhodesia today, for the number of mines in possession of any really substantial tonnage in sight is comparatively small. Until quite recently the majority of Rhodesian mining companies were content to produce in a very hand-to-mouth manner, and it is only during the last two or three years that any really serious endeavors have been made to place Rhodesian properties on a sound and business like footing in so far as development is concerned. The number of mines possessing air-compressor plants is still small, but it is satisfactory to note that two or three air equipments have recently been installed and that the question of erection of other installations is receiving attention. With the large sum of money placed at its disposal by the new reconstruction and absorption scheme the Rhodesia Exploration & Development Co. should be able to place the mines which are being acquired on a satisfactory basis in regard to development. The promoters of this scheme anticipate, indeed, that its consummation will impart to Rhodesian mining affairs an inherent soundness and stability similar to those conditions which have resulted from consolidation of interests among the mines of the Witwatersrand.

H. B. Maufe, who has been appointed head of the Geological Survey of Southern Rhodesia, has arrived in Bulawayo, and after a few days' stay here will proceed to Salisbury to confer with the administrator on the subject of his new work. The Geological Survey has only recently been sanctioned by the British South Africa Co., although it has long been realized that there was urgent need for some thoroughly scientific examination of the numerous mineral belts of Matabeleland and Mashonaland, and for a proper classification and delimitation of the varied and complex strata of the country. It is doubtful whether there is any other territory in the world in greater need of a Geological Survey than Southern Rhodesia. The great majority of

the country's mines have as is well known been opened on the sites of ancient workings workings resulting from the activities of Phenician adventurers or the early Portuguese invaders. The amount of prospecting work that has been carried out in virgin country has been very small and in view of what is known today of the gold belts of Southern Rhodesia and their wide distribution and of the general geological characteristics of the country it does not seem a rash statement to assert as it often is asserted by the most intelligent prospectors in the country that Rhodesia has so far merely been 'scratched' and that there are vast mineralized areas awaiting exploration. Mr. Maufe's work will then, it may be confidently expected, result in the obtaining of much valuable data, valuable from an economic as well as a scientific point of view. New companies are being constantly formed for the purpose of acquiring and working Rhodesian ventures, and among the latest flotations is the Don Proprietary mines with a capital of £75,000 in £1 shares. The company has been registered to acquire the Don, Peggy, and Scouts mines in the Gwelo district of Matabeleland. The company has over £20,000 cash at its disposal as working capital, which in view of the fact that two of the mines, the Don and the Peggy, are already equipped with stamps and cyanide plant and that the Scouts mine will shortly be the subject of a subsidiary flotation can be devoted chiefly to the prosecution of further development. The expenditure on the Don mine to date has been £25,000 and on the Peggy £15,000. The properties have been inspected and reported on by Clement Dixon, M. I. M. M., consulting engineer to the company, and influential Rhodesian and London boards of directors have been got together. The head office of the Don Proprietary mines is at Gwelo, Matabeleland.

TORONTO, CANADA

Discontinuance of Iron and Steel Bounties. —Condition of La Rose.— Other Cobalt Bonanzas.—Porcupine.

The Canadian Government, it is announced, has finally determined not to renew the iron and steel bounties or to give an equivalent in the way of additional tariff protection to those industries. The question was left an open one when the termination of the bounties was decided on last session, though W. S. Fielding, Finance Minister, warned the iron and steel men that it was not likely that any further protection would be granted. The attitude of the Government has probably been largely influenced by the growing free-trade or tariff reduction sentiment of the Western farmers, so strongly manifested during the recent visit of Sir Wilfrid Laurier and his colleagues to the West, and a consideration of the increased representation in Parliament to which that section will be entitled on the redistribution of constituencies on the basis of the census of 1911.

The withdrawal of the bounties is a serious matter for the large steel industries, as the total amount distributed in this form during the fiscal year ended March 31, 1909, amounted to $1,864,000, over one-half of which went to the Dominion Steel Corporation of Sydney, N. S. This company has for some time been shaping its policy in view of the threatened depreciation of revenue. It is increasing its productive capacity by about one-third by extensions now completed or in progress, in order by increased sales and the diminished cost of production on a large scale to make good the loss, and J. H. Plummer, the president, announces that further extensions are being arranged for. The bounties on pig-iron and steel ingots terminate with the present year; the payments on wire rods continue to June 30, 1911, when they also cease. It is the present intention of the corporation, according to Mr. Plummer, to discontinue wire-rod manufacture and substitute other forms of finished steel, as he does not believe that Canadian manufacturers, in the absence of protection, can compete in this line with their rivals in the United States and Belgium. The salient feature in connection with Cobalt is the marked advance in La Rose during the last few days, consequent on the publication of the annual report with a very favorable showing accompanied by later reports of an important find in the mine. The report covering the fiscal year ended May 31, gives the total product at 3,120,078 oz. silver of the value of $1,472,005 produced at a cost of 27.5c. per oz. including the expense of development work. The shareholders received $900,000 in dividends or 12% on the capital after providing for which there remained a combined surplus of the holding and operating companies amounting to $473,740. The ore reserves on the La Rose proper are estimated at 5,544,000 oz. an increase of 576,000 oz. over the previous year's estimate. The Temiskaming is another company whose position has much improved lately. The payment of dividends, discontinued last year in order to obtain funds for the installation of a concentrator, has been resumed at the former rate of 3% per quarter. The mill is now making $1000 per day over expenses from the large accumulation of low grade ore taken out in the course of development. Work is being carried on at the 500 ft. level to catch the ore shoot worked on the upper levels. A report made by the Crown Reserve of the operations of the nine month period ended September 30, showed a revenue of $1,150,303, operating expenses $184,128, and royalty $108,889, leaving net profits of $857,286. Out of this amount $795,966 was paid in dividends, leaving a balance of $61,320. The total surplus on hand was $610,595. The Trethewey has resumed dividend payments, declaring a 10% dividend, after providing for which and covering outstanding liabilities it has a surplus remaining of $102,759. Gould Consolidated, the stock of which has been on the bargain counter for some time, is looking up. The finding at the 300 ft. level by diamond-drill of a vein rich in silver is reported. A shaft will be put down on this vein. The Silver Bar is another mine that has been regarded as a 'dead one' and is showing signs of recovery. It has been closed for about a year, after bagging considerable ore, having an outstanding indebtedness of $35,000. A syndicate is being formed to pay this off and raise money for operating expenses, but there are some legal complications in the way. The property of the Cobalt Central, now in liquidation, is to be sold by auction December 28. The Porcupine camp is apparently on the eve of a boom and is receiving a good deal of attention from British and American investors and mining brokers. The Consolidated Gold Fields Co. of South Africa is in the field, and has secured two properties, having a combined area of 320 acres in a central portion of the camp. On one of these a rich vein, averaging 12 to 15 ft. in width and carrying free gold, have been uncovered for 200 ft. The advent of this company is considered an important event as foreshadowing development on a large scale. It is stated that the Dome company has about 500,000 tons blocked out. The first mining flotation for several months has been made here this week by the United Porcupine Gold Mines, Ltd., capitalized at $1,500,000, of which 500,000 shares of the par value of $1 are being offered at 10c. each. According to the prospectus the balance of the shares has been issued in payment for the property. If the public prove sufficiently receptive it will doubtless be followed by others of a similar character. The experiment of placing on the Ottawa market the peat-fuel manufactured at the Government peat plant at Alfred, Ontario, under the direction of the Mines Branch, has been successful. A consignment of 500 tons was quickly bought at $3.25 per ton and the consumers were so well satisfied that a great many orders for further supplies have been received. The general opinion among those who have tried the peat fuel is that it is cheaper and gives more satisfaction than coal.

LONDON

Development in West Africa.—Tasmania Gold Mining Co.—Conditions at Kalgoorlie.

Recent development work at Cinnamon Bippo and Wassaw mines in West Africa has necessitated a revision of the estimated ore reserve. At the former the reserve on June 30 was 241,669 tons averaging 7.81 dwt. as compared with 208,809 tons on March 31 averaging 10.13 dwt., while at the latter the reserve has risen from 202,916 to 237,442

tons, but the average has fallen from 10.65 to 8.39 dwt. No ore is being extracted at present, as operations are centred on development. It will be seen on analyzing the figures that the total gold content is less now than three months before. This is due to the orebodies being found to be much more broken than was at first supposed.

The Tasmania Gold Mining Co., one of John Taylor & Son's group, is to be reconstructed with an assessment of 2s. 6d. per share which will yield additional capital amounting to £62,500. The company was formed in 1903 to consolidate various gold mines in Tasmania that had become unprofitable owing to the great volume of water coming into the deeper levels. After installing a gigantic pumping plant the company produced large amounts of gold yearly, though without making any distributable profit. A year ago the average content fell, causing a loss on operations. As the orebodies are promising at depth, the directors now advise the raising of this additional capital to continue operations. As already recorded, the production at the Golden Horse-Shoe at Kalgoorlie has fallen recently. At the meeting of shareholders in May the directors promised a special report by the manager, J. W. Sutherland. This has now been issued. His estimate of the ore reserves revised on June 30, gives 903,592 tons averaging 10.32 dwt., as compared with 1,071,638 tons averaging 11 dwt. on December 31 last. The decrease in the tonnage is accounted for solely by the extraction of ore for the battery and not by the rejection of any parts included before. At the same time the reserve has not been increased, as the development work done during the half-year has been preparatory rather than final. The ore mined during the half-year has averaged 10½ dwt. It will be seen that the revised estimate does not reduce the content to the extent expected by many. Mr. Sutherland attributes the recent fall in the output to a combination of factors. First, some of the stopes were in poor ground, second at other points the vein was more faulted than was expected, and third, it happened that mining could not be done at some other points where the ore was known to be richer. In addition a few breakdowns of machinery occurred, in themselves of no great importance, but taken in conjunction with the other circumstances caused further restriction of the output. Mr. Sutherland writes hopefully of the future. The directors have requisitioned the services of Henry Kuss, the French inspector-general of mines, who will proceed to the mine to make an independent examination.

KALGOORLIE, WESTERN AUSTRALIA

Lectures by T. W. E. David.—Conditions on the Golden Mile.— Output for August.

During the past week we have had a series of lectures in Kalgoorlie by T. W. E. David, demonstrator in geology and allied subjects at the Sydney University. The lectures were: (1) 'The Shackleton Expedition to the South Pole'; (2) 'The Journey to the South Magnetic Pole'; (3) 'Mexico—Past and Present'; and (4) 'The Origin of Ore Deposits, and Remarks on Artesian Water.' Mr. David was with the Shackleton party in 1907-09. He and three others were the first men to ascend the active volcano of Mt. Erebus, 13,000 ft. high, and also to locate the south magnetic pole. He did not participate in the final dash to the south pole. In 1906, Mr. David went as a delegate to the International Geological Congress at Mexico City. As far as geology is concerned he is both a thinker and a worker, and has studied Australian conditions closely. All the above lectures were illustrated by fine lantern slides. In connection with the first subject, the lecturer explained the manner in which one should dress, eat, and drink in such cold latitudes; the difference between icebergs and snowbergs; he showed slides of several fossil plants and leaves, identical with those found in Australia; he said that granite, limestone, schist, and coal seams exist in Antarctica. The coal gave on analysis 68% of fixed carbon, and may some day be of economic value. The second lecture was somewhat on the lines of the first, but details of the locating of the south magnetic pole were given. The lecture on Mexico was especially interesting, the lecturer going deeply into the history of the country and its present state under President Diaz with the great improvements in Mexico City and other towns, irrigation and electric power schemes, the geographical, geodetical, and geological surveys in progress, meteorological observatories, and touching lightly on the mining industry. 'The Origin of Ore Deposits' was an unusually interesting discourse, illustrated by pictures, maps, and rock sections. Mr. David began with a consideration of the old theories of the earth's formation. Norman Lockyer held that the earth had been formed by a number of meteorites flying through space, and coming in contact with one another when traveling at a terrific speed, had become fused together. T. C. Chamberlin, of the Chicago University, propounded the planetesimal hypothesis, and assumed that this process was still going on, and at the present day the earth was getting bigger and heavier. It was calculated that 100 tons (an unknown quantity falling into the sea) of meteorites fell upon the earth every year. Probably 500,000 tons of meteoric dust fell on the earth annually. During the South Pole Expedition experiments were made to substantiate this dust theory by taking a carefully weighed quantity of pure snow and finding the percentage of solids contained. A surprising amount of fine dust was found. Meteorites are cold in the interior, but hot on the outside on account of the friction due to rushing through the earth's atmosphere. Through the accumulation of meteoric material, great pressure is held to have developed, and the hollows been gradually filled. From the

Part of Oroya-Links Dump Now Being Treated.

evidence of earthquake phenomena, Mr. Chamberlin adduces strong proof of the correctness of his theory. Seues has accepted the Chamberlin views. In discussing volcanoes Mr. David argued that in eruptions there were three stages: (1) at the height of eruption when everything was extremely hot, and hydrogen, oxygen, and chlorine were emitted, the two former combining to form water, which came down to earth in the form of rain, this water having never seen the light of day before. (2) The eruption cooling off somewhat, when sulphur and arsenic were emitted. (3) The quiescent stage when large volumes of CO_2 were given off, as occurs in certain spots on the earth at the present time, and carbonaceous material was formed. Solutions eventually were formed, which filled in the cracks on the earth, gradually leading to the formation of metalliferous lodes. In the Associated Northern Blocks, the Ivanhoe, and Great Boulder mines at Kalgoorlie, at depths from 500 to 2650 ft., Mr. David had seen carbonaceous mineral in the form of graphitic slate and schist, bearing out the theory of the CO_2 coming up from great depths, and forming these minerals. In the first-mentioned mine, methane had been and is still occasionally given off in quantity. Regarding the lodes at Kalgoorlie, Mr. David considered them intensely interesting, and demanding much research, such as has been done by Messrs. Gibb, Maitland, Larcanbe, Gibson, Maclaren, Woodward, and others. During the lecture, pictures and sections were shown. Among others were the Mt. Morgan mine; the Broken Hill lode and mines; the lodes at Joachimstahl, in Bohemia, Austria; the Bendigo saddle-reefs (after Rickard); the Ballarat Indicator; and sections of the country in Central and Western Australia. While

there is a great area of artesian water in Australia there is not enough for purposes of irrigation. Wells must not be sunk too close together or one would rob the other. The popular idea of artesian water basins was explained and the real formation shown and proved by experiment. There were springs in the limestone cliffs at Eucla in the Great Australian Bight and Mr. Woodward one of our geologists, decided to sink a bore for water in the Permo Carboniferous rocks in the northwest of this State. Geologists were astounded, but the well was sunk and developed a large supply of water. Altogether, the series of lectures was most profitable and interesting.

This is the season when for the next six months the wind is strong and tailing is blown all over the place, making work disagreeable near the mines, besides damaging plant and machinery. Some of the sand heaps have been sprayed with salt water, which forms a crust over the tailing. At other places the material is being re-treated and pumped into ponds. The Perseverance company is using the South Kalgurli heap for stope filling. The Lake View & Star is the latest to install machinery to pump away its tailing. At one time the dumps were great landmarks, but one by one they are being removed. In development profitable ore has been cut at 2650 ft. in the Great Boulder, at 1850 ft. in the Kalgurli, and at 500 ft. in the Lake View & Star mines since my last notes. It is probable that there will be a drop in the Oroya Links output next month, as the Eclipse mine cannot keep the 50-stamp mill fully employed. As affairs are now the Associated, Associated Northern Blocks, Chaffers, and Oroya Links may be classed as having poor prospects.

Only $38,500 was paid in dividends for August, but $475,000 has been declared for September. The gold output for the month totaled $2,470,000, and the yields from the principal producers were as follows:

Name.	Tonnage.	Value.	Profit.
Associated	10,853	$73,500	$1,600
Associated Northern Blocks	2,500	29,000	16,500
Chaffers	4,413	33,500	3,450
Golden Horse-Shoe	23,867	170,000	800
Golden Ridge	2,400	31,000	14,000
Great Boulder Proprietary	19,048	244,500	123,000
Great Boulder Perseverance	†13,138	83,000	‡7,800
Great Fingall	10,887	82,500	13,000
Hainault	6,150	38,500	5,500
Ivanhoe	19,622	205,000	100,000
Kalgurli	11,060	142,000	76,500
Lake View Consols	*9,385	7,900	1,950
Lake View & Star	12,070	70,000	‡18,000
Oroya Brownhill	*21,945	26,500	13,500
Oroya Links	10,902	67,500	8,500
Oroya Black Range	4,600	46,000	10,500
Sons of Gwalia	13,510	118,000	45,500
Sons of Gwalia South	2,432	23,000	8,000
South Kalgurli	9,350	61,500	8,500

*From old dumps. †First return from new mill. ‡Loss.

BUTTE, MONTANA

Development of Deep Levels in Important Mines. — Tests of Montana Coals.

What is known as the Tramway shaft of the Red Metal company is being deepened and a station is being cut at the 2000-ft., where another level will be opened. Extensive development is going on in the Rarus mine, another Red Metal property, and that mine is again yielding good ore. Development at the Right Bower group has been practically suspended, as its purpose has been accomplished, namely, to prove the ownership of the disputed vein on which the Butte Ballaklava company was mining, and on which it has been enjoined by the court. That the Butte Ballaklava ground contains other good veins not in dispute is admitted by officers of the Anaconda company. The Butte Ballaklava company is doing much development and has opened another fine body of ore on the 700-ft. level.

The North Butte and the Tuolumne company have renewed activity in preparation for the coming trial. It is understood that offers have been made to some of the large stockholders of the Tuolumne for a purchase of a controlling interest by the North Butte, but these stockholders refused to sell unless the stock of some of their friends was purchased. There was also a difference between the North Butte people and the Tuolumne officers as to the value of the Tuolumne fractional claim. The Tuolumne people wanted to sell at a rate of $8 per share for the 800,000 shares of stock, while the North Butte offered, in exchange of stock, about $4 per share. Reports from the Raven mine indicate a probability that the patience of Raven stockholders is to be rewarded. Some high grade copper samples have come from the 1300-ft. level, the first ever found in the mine. A new level is being opened at the 1500, and if the ore is found at that depth it is almost a certainty that the Raven will develop into a good copper mine.

At the Washoe and Great Falls smelters tests have been carried on for some time with Montana coal with the idea of substituting it for Wyoming coal, and to use coal fire direct at the Great Falls smelter instead of deriving heat from coal gas, as at present. The shaft of the St. Lawrence mine is being repaired, and new ore bins are being built, to be completed in six weeks. Cross-cutting and driving is going on at the Badger State mine, with good results, and sinking is being pushed at the new Gagnon shaft and at the four-compartment shaft on the Belmont, which has reached a depth corresponding to the 2100-ft. level of the Anaconda mine, with which it is being connected on each level. At 2400 ft., the Belmont shaft will be connected with the deepest level of the Anaconda mine and will be used as an auxiliary shaft. It will also improve ventilation in all the Anaconda Hill mines. It is situated about a mile south of the main shaft of the Anaconda and is the largest shaft in the district.

SALT LAKE, UTAH

Important Changes in Management. — New Mill for Park City. — Ontario to Resume.

Two personal items of interest have been announced within the past few days: D. C. Jackling, manager of Utah Copper, has been appointed manager of all Guggenheim interests in the Western United States, Mexico, and Alaska, and Colin McIntosh, manager of Ohio Copper, has resigned and will devote his time to his private interests. Mr. Jackling has been at the head of Utah Copper since it was scarcely more than a prospect and has brought it to the position where it is one of the largest producers in the world. Mr. McIntosh took charge of Ohio Copper when the control passed to the Heinze interests. In addition to developing the mine and building the mill he has carried the company through a very trying financial period and has brought it into the producing class. With the completion of the mill, only one-half of which is in operation, Ohio will be one of the large producers of the world. The methods and systems which Mr. McIntosh installed in both mine and mill will not be altered by the new manager, Al Frank, who has been chief engineer on the Heinze staff. The Starlus group in Bingham has been bonded for $800,000 to Eastern capitalists. The group lies next to the Utah Copper and is owned by E. A. Wall, one of the original owners of the latter company. The Grasselli Chemical Co., which operates a mill at Park City for the treatment of zinc tailing, is building a new mill on the flat north of the town. This plant, which will have a daily capacity of 125 tons, will treat an accumulation of old mill tailing along Poison creek. The accumulation is 3500 ft. long, 500 to 1000 ft. wide, and has an average thickness of two feet. H. M. Crowther has taken a lease on the Ontario mine and will probably operate it more extensively than at any time since the drain-adit caved some years ago. It is not likely that the company will operate the mine again unless the lessees open some large bodies of ore at present unknown. The Ontario has produced $45,000,000 and paid $15,000,000 in dividends, the largest of any silver-lead mine in the country. The old 'bogy' of the Success mining deal will not

down, and another suit has been filed against Jesse Knight and others for an accounting and restoration of rights. The claim is that Knight secured control of the Success, merged it with Colorado, and canceled a large number of stock certificates on the ground that an assessment (notice of which was never given) had not been paid. This is only one of several suits that have been and will be filed. C. A. Pringle, manager for the Tintic Mining & Development Co. and for the Yampa Smelting Co., has resigned that position and has been succeeded by J. W. D. Moodie, of Los Angeles, and formerly of Park City. Sioux Con. has declared its regular quarterly dividend of 4c., bringing the total within the last two years up to about $800,000. The company has a cash balance, after deducting the dividend, of over $65,000. After four months of shut-down the Mammoth is ready to resume operations at regular capacity. The wrecked hoisting machinery has been replaced and the shaft largely re-timbered. The cable is on hand and all that remains is to string it and finish timbering the shaft. The Scanton mine in North Tintic has made a find of a good sized body of zinc carbonate. The company is mining 600 tons of zinc ore per month and shipping it to Wisconsin. A deposit of antimony has been opened at Antimony in Garfield county, but no shipments have been made, as a suitable method for treatment has not been found. This ore contains gold, and experiments have been made with the Masson method of treatment by which antimony is extracted by a chemical process and the tailing cyanided for the gold. A project which will mean much to the camp of Alta, if carried out, is the Alta & Jordan Valley railroad, which recently filed articles of incorporation. Alta possesses much good mining ground, but freight rates are high and the camp is isolated for several months each year on account of snow. A railroad would be a great help to the camp. The Hornsilver, in Beaver county, is planning to build a concentrating mill of 100 tons daily capacity this winter. The company has been making extensive tests to determine the best method of treating the ore and will doubtless remodel the old mill at the mine. There is considerable low-grade ore stored in the old stopes and drifts and also a large tonnage that has never been mined.

NEW YORK

Conditions in Wall Street Improved. — Copper Going Up. —The Ray Central Deal.—El Rayo.

The bull campaign now in progress on the New York Stock Exchange is assuming well-grown proportions. The ostensible head of the movement is the house of Eugene Meyer Jr. & Co. Steel has been used as a leader. It has been marked up to 80⅛ and is evidently to be put still higher to induce public interest. Other elements are assisting the rise in prices. The political situation is the largest market factor. Wall Street is professing a strong belief in the defeat of the Roosevelt forces, and a large part of the present campaign is built up on the theory that the New York State election will result in a defeat for the growing and supposedly dangerous radical theories of Mr. Roosevelt, and a big triumph for the safe and sane treatment of corporations. In a sense, therefore, the present market is an appeal to public sentiment. The dangers to which market operators are exposed are consequently obvious. The copper metal market is in a fair way for complete recovery, though it seems to be understood that it will not be allowed to soar with consequent disastrous reactions. The market is reported as sold ahead; the three largest agencies, United Metals, Phelps-Dodge, and the Guggenheims, are all quoting 13 cents with nothing for delivery until after January next. Killing off the consumer with 25-cent copper is directly responsible for the accumulated surplus which has clogged the market. The General Development Co. has come in for sharp criticism on account of the Ray Central deal. When the $100,000 of bonds was taken by the Development company, it also had an option under which it acquired, at $1 per share, 200,000 shares of stock. All of this, it is said, has been peddled out as the market would take it during the past few months at three and four times the option price. At the meeting of the Development company held this week the board, acting upon the advice of J. Parke Channing, resolved to reject the Ray Central option, and the Lewisohn representatives on the Ray Central board sent in their resignations, to become effective upon the election of their successors. Just what steps the Philadelphia men, who are now again in control of Ray Central, intend to take has not yet been announced. It is looked upon as certain that eventually the company will be absorbed by the Ray Consolidated, though in all likelihood there will be some independent development done in the meantime. The Philadelphia contingent has been a heavy buyer of the stock since the position of the General Development Co. has been made public, and this is thought to be an indication that some deal may be made in the future. The directors resigning from the Ray Central board were Julius Lewisohn and Alvin Untermeyer. Oscar A. Turner, who was formerly connected with the Ely Central Copper, also resigned from the Ray Central board and was succeeded by J. B. Cummins. The bonds of the Braden Copper Co., recently authorized, have been underwritten by Eugene Meyer Jr. & Co. at 95, and stockholders may subscribe to the extent of one-sixth of present holdings. The mill is expected to go into operation in July next. Federal Mining & Smelting is in a bad way. Preferred sold this week at 37, a new low record. It was 112⅞ in 1906. The common sold at 12, as against 199 in 1906. When the American Smelters Securities Co. took over the control of the Federal the common was about $100 per share. The new directorate of the Granby Con. has semi-officially announced a resumption of dividends on a basis of 1% quarterly. Samuel Newhouse has become identified officially with the South Utah Mines & Smelters, a reorganization of the old Newhouse Mines & Smelters, although he has not, heretofore, been an official of the new concern, though the largest stockholder. The company is shipping concentrate to the Tooele plant of the International Smelting & Refining Co. and expects to output 1000 tons per month. The Lake Copper Co., which last winter was acclaimed the greatest recent copper development in the Michigan copper country, and sold up to $90 per share on the Boston Exchange, now requires further financing, 13,450 shares of treasury stock having been underwritten at $35 per share. Stockholders may have rights at this figure on the basis of one share for each seven shares held. The $444,000 which will be available by the sale of this stock is expected to finance the company for a year and a half. The El Rayo Mines Co., which has recently been paying dividends, has announced that further dividends will be deferred until after January 11, 1911, when the time for the exchange of El Rayo and Dolores into the enlarged Mines Company of America will expire. Both the Mines Company of America and the Dolores are making similar postponement of dividends, the current earnings being applied to the purchase of the La Dura in Sonora, Mexico. This is the first additional property to be acquired by this merger, formed some months ago as a developing and holding company. On the exchange basis more than 90% of both Dolores and El Rayo has been exchanged for the new Mines Company of America. The deal for the La Dura involves a cash payment of about $400,000.

L. Vogelstein & Co., who represent Aron Hirsch & Sohn in this country, have secured the contract for the refining and selling of the output of the Mt. Lyell, which is one of the largest producing coppers of Australia. These ores have heretofore been handled by the American Smelting & Refining Co. at its Baltimore plant. The Hirsch-Vogelstein combination is making a strong bid for the handling of all the Australian output. An electrolytic refinery has been erected by these interests, acting jointly with the Mount Morgan Gold Mining Co., the refinery being known as the Electrolitic Smelting & Refining Company of Australia, Ltd. This plant is now being enlarged to take care of the Mt. Lyell output, and the refined copper will be sold by the Hirsch-Vogelstein combination.

General Mining News

ALASKA

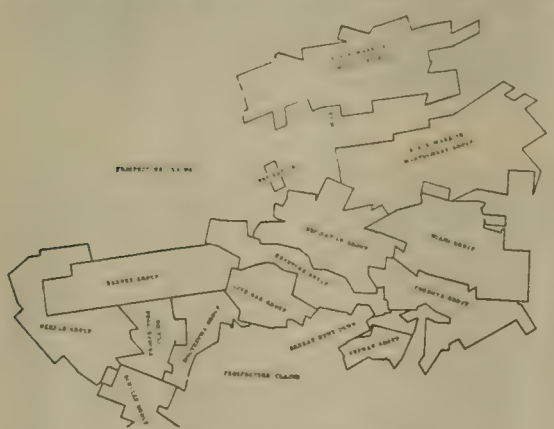
The Alaska Mexican Gold Mining Co reports for the month ended October 19 as follows: mill, 120 stamps; run 30 days 17 hr. 54 min.; water power, 2 days 13 hr. 54 min.; steam power, 28 days 4 hr. 20 min.; tons ore crushed, 19,772; tons concentrate saved, 365; estimated value of free gold, $38,434.29; estimated value of concentrate, $87,295.92; less amount due Alaska United G. M. Co., $1912.08; total production, $79,818.01; realizable value, $68,270.73; operating expense, $29,403.07; net operating profit, $38,867.66; construction expense, $10,073.62; yield per ton, $3.58; stock of broken ore increased 2372 tons; development work, 254 ft. in ore, 316 ft. in waste; assays run from $1.44 to $2.96.

The Alaska Treadwell Gold Mining Co. reports for the month ended October 15 as follows: 240-stamp mill, run 30 days 6 hr. 21 min; water power, 3 days 14 hr. 37 min.; steam power, 26 days 15 hr. 44 min.; 300-stamp mill, water power, run 22 days 4 min.; tons of ore crushed, 240 mill, 15,952; 300 mill, 38,248; total, 74,200; concentrate saved, 240 mill, 625 tons; 300 mill, 610 tons; total, 1235 tons; estimated value free gold, $115,400.11; estimated value concentrate, $65,720.90; total production, $181,121.01; realizable value, $172,557.01; operating expenses, $88,566.27; net operating profit, $83,990.74; construction expenses, $28,245.33; yield per ton of ore crushed, $2.44; stock of broken ore increased 17,077 tons; development in ore 153 ft., in waste 318 ft.; assay value, $2.18 to $3.11.

ARIZONA

GILA COUNTY

(Special Correspondence.)—Hayward, Holden, and Smith, mining engineers of Denver, Colorado, have completed an examination of the Inspiration mine for Hayden, Stone & Co., of Boston. One of them says the mine can easily supply a concentrator with a capacity of 5000 tons per day, but that the construction of such a mill will probably not be commenced until next spring, as much valuable



Miami Portion of Globe District.

information can be obtained from the working of the Miami Copper Co.'s plant, which begins operation about Jan. 1 next.——The vein opened last week on the eighth level of the Superior & Boston mine has proved to be the so-called Iron Ledge fault and not the Great Eastern vein. The Iron Ledge crosses the Great Eastern diagonally. The drifts following this fault have shown much iron and some copper stain. These drifts are 30 and 50 ft. long, respectively; the longer one running northward is expected to strike the Great Eastern vein in a short distance.——The winze sunk on the Old Dominion vein at the Arizona-Michigan property is 106 ft. deep and a cross-cut has been driven from the winze to the vein at that depth. This cross-cut is 25 ft. long and has penetrated the vein 8 ft., but has found only crushed material stained with hematite.

The Superior & Globe Copper Co. has started a second diamond drill hole horizontally into the country rock from the 650-ft. level. This hole is 60 ft. long and is to drift. It is estimated that it will cut a vein 200 ft. from the starting point. The hole driven downward to tap the Verma vein at 1260 ft. from the surface, is 430 ft. deep. H. V. Snell is superintendent.——The Summit Copper Co. employs 48 men in development work, ten miles west of Miami, where operations have lately exposed much high-grade copper ore.

Miami, October 29.

MOHAVE COUNTY

(Special Correspondence.)—There is considerable activity in the San Francisco district, near Kingman, where the Tom Reed and Gold Road mines are producing steadily. Several engineers and prospective investors have been in the district recently. At the Frisco mine, in Union pass, a large body of ore is reported to be developed, and the 100-ton mill is nearing completion rapidly. Two recent discoveries of good-grade gold ore are reported from Secret pass, three miles to the south. Five miles farther south the Ruth mine is being reopened and preparations are going forward for the construction of a mill. The deepest workings here are a 115-ft. shaft on the Ruth claim and a 216-ft. shaft on the Rattan. A new working shaft has been started on the foot-wall side of the vein on the Ruth, dipping at an angle of 60°. This is 35 ft. deep and in a good grade of gold ore at the bottom. A head-frame and hoist, good for a depth of 500 ft., will be erected.—Engineers recently examined a tungsten property in the Aquarius mountains, Mohave county, about 12 miles by hard trail from Owens on the Big Sandy river. The property has not been developed to any great depth, but adits have opened several small veins, in which wolframite occurs in bands in a quartz vein. Up to the present work has consisted in mining the high-grade mineral and 8 or 10 tons have been shipped. Development consists of many open-cuts and small adits, the longest being 175 ft. The Planet mine, near Bill Williams fork, has been closed recently by the General Development Co. This company has been operating the mine for more than a year, during which the workings have been extended to a depth of 600 ft. Several drill-holes have also been put down to explore the sulphide zone. It is reported that low-grade sulphides were developed, but accurate information is not obtainable. There is some activity on the California side of the Colorado river from the Copper Basin district, north of Monument peak, south to Riverside mountains. Several properties have been reopened and prospecting is in progress at many points. The Calzona Mines Co. and the Steece Copper Co. have resumed operations at their properties 17 miles southwest of Parker. Several carloads of machinery and supplies have been shipped in within the last few weeks.

Kingman, October 28.

CALIFORNIA

AMADOR COUNTY

(Special Correspondence.)—N. Glavinich was killed in the South Eureka mine on the night of October 29, while repairing the shaft track below the 2500-ft. station. He was struck by a falling rock, and fell to the 2700-ft. point where a bulkhead had been placed. Extensive shaft repairs are in progress at the South Eureka mine.——The Chichizola Estate Co. of Amador City attached the Wildman Mahoney mines at Sutter Creek last fall, to secure the payment of a debt of the California Con. Mines Co., owning these mines. The property is now advertised by the sheriff, who will sell it to the highest bidder on November 12, to satisfy the judgment in favor of the plaintiff. The sheriff also advertises the sale of the Consolidated Keystone properties, on November 19, to satisfy a judgment in favor of D. J. Camble, who attached the property in the interest of himself and others for wages due. The court has appointed John H. Isham receiver for all the property of the California Con. Mines

Co., which includes the Keystone group at Amador City and the Wildman Mahoney group at Sutter Creek.

Jackson, October 28.

IMPERIAL COUNTY

The long-idle mines at Hedges, six miles northeast of Ogilby, on the Southern Pacific, are being rejuvenated. About December 1, crushing in the 100-stamp mill will begin, but 50 stamps being dropped at first. A new 6-in. pipe line is being laid from the pump station on the Colorado river, and the old water line will be utilized as an oil line between the railroad and the mines. It is expected gradually to get the entire 140 stamps in operation, and perhaps to increase the size of the plant.

KERN COUNTY

The discovery of a new vein of high-grade ore at the Butte mine at Randsburg has resulted in renewed activity on Butte hill. The vein has been traced for nearly 1500 ft. into the adjoining King Solomon ground. Six shafts and five sets of lessees are opening ore at various points along the strike. At the Butte mine, the superintendent, Mr. Fayhe, is sinking on the ore, and the shaft has passed 50 ft. and still shows the vein, 12 in. wide, and worth about $100 per ton. A recent cloudburst is responsible for the discovery. In walking along the road after the downpour, Mr. Fayhe picked up pieces of ore showing gold.——Easterly from the Butte shaft, Watchman Bros. & Cagle have reached a depth of 100 ft. and are taking out good ore. Farther along two shafts are being worked on the Halford lease. Three men are being employed on the adjoining Zackley lease and some good ore is being taken out.

TUOLUMNE COUNTY

(Special Correspondence.)—J. L. Witney of Los Angeles has completed an examination of the Dutch and Sweeney mines, on the Mother Lode, near Jamestown. It is probable that this property will be reopened. The shaft is 1730 ft. deep and about 30,000 ft. of levels have been driven. On the 1200-ft. level ore of milling grade shows a width of from 50 to 75 ft.——At the Harvard mine, north of the Dutch and Sweeney, a discovery of rich gold ore on the 900-ft. level is reported. This property is developed down to the 1100-ft. level. A 60-stamp mill is in operation.——The Water Lily Gravel & Leasing Co., composed chiefly of San Francisco people, has begun operations on a gravel property on the Stanislaus river, three miles below Robinson's Ferry. The deposit is in an old river bed and is reached at a depth of 40 ft. A two-compartment shaft, 4 by 8 ft., will be sunk and drifts run to the gravel.

Jamestown, October 28.

The United Mines Corporation of Cleveland, Ohio, is developing a group of mines near the town of Tuolumne. This group includes the Eureka, Deadhorse, Lady Washington, Grizzly, and New Albany. These mines are all on the East Lode and several of them have been worked extensively, particularly the old Eureka, Deadhorse, and Grizzly. Hardinge conical tube-mills are in use in the metallurgical plant.——It is reported that a large pocket has been discovered in the Tarantula mine, north of the Rawhide.——J. C. Huston has resumed river channel mining at Moffit bridge, near Chinese, and will take advantage of the low water.——In the Longfellow mine, at Big Oak Flat, driving and cross-cutting are in progress at the 800-ft. level. The shaft will be sunk to the depth of 1000 ft.——The Karnac Mining Co. has bought the 10-stamp mill at the Horseshoe mine and hauled it to its property near Rawhide.——It is said that Los Angeles men have bonded the Wickam mine, near the Rawhide.

COLORADO

GILPIN COUNTY

John W. Dean, Vandyke Moore, and Chris Grendmaier, miners employed in the Frontenac mine at Central City, were instantly killed by the premature explosion of a blast in a cross-cut on the 600-ft. level, on October 22. It is thought that in loading a series of holes a detonater in some manner was pushed to the side of the stick of nitro-powder in which it had been inserted, and was forced against the rock at the side of a drill-hole when the charge was being tamped. The blast caused the explosion of 60 additional sticks of 60% powder lying on a shoveling sheet at the face of the cross-cut. Another theory was that something caused the box of detonators to explode, which exploded the powder on the floor, the blast exploding later. These theories were advanced for the reason that two distinct explosions were heard.——The Federal mine in Russell gulch has a face of ore 4 ft. wide, which carries gold and copper.

OURAY COUNTY

The Anderson-Halter Mines Co. has bought the Micky Breen mines and mill and the Grizzly Bear mines near Ouray. The properties have been idle for some time.

SAN MIGUEL COUNTY

Lafe Crandall, a miner, while at work in the Smuggler-Union mine, near Telluride, drilled into a 'missed hole' on October 27 and was seriously though not fatally injured.——The Moorehead Mining & Milling Co. has filed a suit against the Liberty Bell Mining Co. for damages claimed for alleged trespass. It is another apex case.

IDAHO

SHOSHONE COUNTY

(Special Correspondence.)—The Marsh Mining Co., operating in the Coeur d'Alene, will begin shipping about the middle of November. Driving on the 500-ft. level is under way. The vein was cut recently by a cross-cut from the 200-ft. level from the main shaft. The vein was 5 ft. in width, of which more than 50% is of clean shipping ore.——E. P. Spalding, president and manager of the Monarch Mining Co., operating in the Coeur d'Alene, says that the new 200-ton mill will be ready for operation December 15. Meantime the old 75-ton mill is in operation on the ore taken out in development. Shipments are at the rate of 6 to 8 cars of concentrate monthly.——Ground has been broken at Wallace on the site of the new 400-ton concentrator for the Hercules Mining Co. The company has been operating the old Tiger-Poorman mill at Burke. The mill will be modern and will probably take four months for construction.

Spokane, October 24.

MICHIGAN

ONTONAGON COUNTY

Adventure's vertical shaft has reached rich copper ground in No. 1 lode. The shaft is not placed exactly parallel with the strike of the lode. The vertical distance through the copper-bearing part of the lode, as exposed in the shaft, is about 16 ft., according to the latest developments. Assuming an incline of 45 degrees for the lode, this indicates that the rich part of the lode, when the shaft perforates it, has a thickness of 12 ft., measuring at right angles to the incline. People from all parts of Ontonagon county have visited the shaft and carried away specimens, and the general sentiment is that a highly satisfactory showing has been made. Sinking is still in progress. It will be necessary to get 15 or 20 ft. below the lode before cutting a station, if one should be established at this time. It has not been fully determined that a station will be cut at this depth during the present year.

MISSOURI

JASPER COUNTY

(Special Correspondence.)—Among the new producers in the Joplin district is the Jim D. mine, at Webb City, which has been making regular shipments of 30 tons weekly for some time past. The mill is on the M. & S. land at Carterville where a deposit has been opened at 140 ft. in boulder ground. It is neither typical sheet ground nor soft ground. The mill is a new one of 150 tons capacity.——The Mercedes Mining Co. has been developing a deeper run of ore on the Center Creek land, taking a large stope from the 130-ft. level to 190 ft. The company is making

an effort to mine the lower ground without running new drifts. There are two shafts, one operates on the upper level and the second has been put down to the greater depth. This mine has been producing steadily for years. ——On the same land the Comet company has begun operations with the new 200 ton mill on land which was extensively mined in the early days, when the operations were shallow—from the surface to 150 ft. Lately operations have been deepened to 190 ft. where drill holes showed better ore. The Comet company has opened the Rattler mine which operated here previously. —The Maggie G. mine at Thoms station is being reopened and unwatered after a long idle period. ——A new shaft has been sunk north of the mill which will enter the ore at 190 ft. A long tramway has been built to connect the new shaft with the mill. The blende is high grade and is found in large pockets. There is only a small amount of galena. ——In the vicinity the old Katherine mine has run drifts into rich ore in two directions. This company is one of the oldest in this part of the field. Stopes have been taken up at different times until the drifts are very high and heavily timbered. ——To the west of Joplin, in the recently developed disseminated ore field, several companies are working. Some new mills have recently been added to the camp, among them the Muskingum, a modern plant of 300 tons capacity. Some new features have been added to this mill, one being the greater attention given to the slime. The mill con-

A Joplin Prospect.

tains six concentrating tables of different types. Another unique feature is the ventilating system of the mine, there being large suction fans attached to drill-holes sunk to draw out the foul air, the pure air flowing down the main shaft. When the drift is extended too far beyond the drill-hole for perfect ventilation, another drill-hole is sunk to the face.——The Hackett mill is progressing slowly, owing to the elaborate plans for its equipment. The main buildings have been completed and there remain only the placing of the machinery and its adjustment.——In the same field the Kittie Mack has recently completed a 225-ton plant to replace one destroyed by fire, and the company has resumed operation after months of idleness. The plant is modern throughout, and more attention is given to the saving of fine than previously. The ground is well opened at the 180-ft. level and carries an 18-ft. face of disseminated ore.——A new prospect has been opened on the Sampson land near the Kittie Mack lease which is unique for that part of the field, as it is in soft ground instead of the prevailing disseminated ground. The ore occurs above the disseminated level and a shaft has reached that depth. It also carries a larger per cent of ore.

Joplin, October 27.

MONTANA

SILVER BOW COUNTY

Four miners in the Leonard mine at Butte were instantly killed by a premature blast on Tuesday morning last. They were Finns.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence.)—The last shipment from the Socorro mines consisted of 11 bars of gold and silver bullion, produced from only a part of the precipitate on hand. An increased tonnage is being crushed. Work is progressing in sinking the 3 compartment vertical shaft. ——At the Ernestine the mill is running full time, crushing 100 tons per day. 36 sacks of high grade concentrate was produced from 620 tons crushed. The precipitate accumulated since the recent pipe line installation has not been melted. At the Deadwood mines rapid progress has been made in the erection of the mill. The main building, started a month ago, is under cover. The reinforced concrete foundations for the mortars are completed, the engine foundation is being laid, and all other work is keeping pace. Cheap power and filter operation have received exhaustive investigation by the owners of this property, and it is believed the innovations in these departments will prove to be a big stride toward low milling costs.—— The Mogollon Gold & Copper Co. is grading for a sawmill which will be installed to square timbers for the main shaft on the Cooney mine, which the management reports will be unwatered and retimbered. In the meantime the main adit is being advanced on the East vein, which is showing native copper at a depth of 600 ft. below the apex of the hill. Development continues on the Bloomer Girl, Fluoride, the Little Charlie groups, and the Malachite mine, all this work furnishing a milling grade of ore.——The Gold Dust Mines Co. is developing its property situated on a vein lying south of the Last Chance. Gold predominates in the ore thus far developed.

Mogollon, October 28.

NEVADA

ESMERALDA COUNTY

(Special Correspondence.)—The Goldfield Mining & Ore Reduction Co., for which M. Arnold is manager, has had the Golconda claim under lease from the Goldfield Con., and is negotiating for an extension of the lease. This lessee has sunk four shafts, one to a depth of 428 ft. Several hundred feet of cross-cutting has been done, and if lease is renewed exploration will continue in the search for ore. The company has expended $115,000 in development and equipment in Goldfield.——The Goldfield Annex Mining Co., composed of Philadelphia operators, having a lease on the Palo Verde claim of the Jumbo Extension group, has sunk a 1065-ft. shaft on that property, 400 ft. east of the Clermont shaft of the Goldfield Con. group. The shaft has three compartments and is timbered. Surface equipment consists of a 75-hp. electric hoist and an 8-drill air-compressor. The lateral work from the shaft amounts to 2500 ft. on all levels. They found some ore on the 800-ft. level, some of which was marketed. A raise is being cut from the 1000-ft. level to the vein, on its dip, that was opened on the 800. Alex T. Baugher, one of the stockholders, who has direction of operations, states that the company's lease runs one more year.——Donald Ferguson, while recently in the East, effected a consolidation of various properties lying east of the original part of Goldfield under the name of the Pittsburg-Nevada Mining Co., for which he is the manager. The groups merged include the Red Top, Dixie, Mayflower, and Frances. There are now several shafts, including one 400 ft. deep. Work on the Mayflower opened a 53-ft. vein at a depth of 400 ft., 29 ft. of which is quartz containing excellent value in gold and silver. New equipment is to be installed and development is to begin soon.——The Combination Fraction, controlled by George Wingfield, and managed by C. D. Wilkinson, has a 750-ft. shaft, from which seven levels have been opened. Work is progressing on six of these, producing 60 to 70 tons of ore per day, which runs $20 to $30 per ton, and is treated at the old Nevada-Goldfield plant which is under lease to the Fraction company.——Two sets of lessees at work on the Booth are not yet shipping ore; four sets are at work on the Sandstorm and Kendall,

from which small shipments are being made. The Goldfield-Daisy Syndicate, owner of the Daisy at Diamondfield, has let one lease from which some ore is being shipped. Lessees are at work on the Blue Bowl, but are not shipping as yet.

Goldfield, October 27.

EUREKA COUNTY

(Special Correspondence.)—The Buckhorn mine, one of George Wingfield's Nevada properties, situated 35 miles south of Palisade, and 30 miles from Beowawe, produces gold and silver ore, which it is believed can be successfully cyanided. It is undergoing thorough development with F. J. Seibert in charge. The erection of a crushing and cyanidation plant has been deferred till next spring. It is thought the Palisade & Eureka railroad will be rebuilt. This line, or a large part of it, was destroyed by high water last May.

Eureka, October 28.

HUMBOLDT COUNTY

(Special Correspondence.)—The Ohio mine, situated on Rebel creek, 54 miles north of Winnemucca, the sale of which to Milwaukee men was negotiated by Donald Ferguson of Goldfield, is to be put in order this winter and a mill is to be erected next spring. Mr. Ferguson states that mill ore of the value of $100,000 is on the dump, and that a large tonnage of similar ore is blocked out in the mine. The ore carries gold and silver which will probably be recovered by concentration and cyanidation. Mr. Ferguson is to have the management of the property.

Winnemucca, October 26.

NYE COUNTY

(Special Correspondence.)—The Goldfield-Bluebell Mining Co., operating the old Stokes mine and a 30-stamp mill at Berlin, has been shipping concentrate and gold bullion with some regularity for two years. The ore is gold-bearing quartz, the recovery being made on amalgamating plates and on concentrating tables. The ore runs about $8 per ton. The vein has a width of 18 in. to 10 ft., and is opened by an 800-ft. incline shaft. The mill, hoist, and other machinery are operated by steam power, wood being used as fuel. D. S. Johnson is manager. Berlin is 65 miles south of Austin.

Berlin, October 25.

(Special Correspondence.)—The Rescue and North Star properties, situated close to the Belmont at Tonopah, are being reopened by Lockett and others, with A. J. Canavan in charge of the work.

Tonopah, October 28.

STOREY COUNTY

On October 28 hydraulic elevator No. 2 in the C. & C. shaft at Virginia City was lowered into the sump below the 2650-ft. station. This is the greatest depth to which the ejector has ever been worked. It lifts the water to the tank on the 2150-ft. level, where the electric pump sends it to the Sutro tunnel level.

CANADA

BRITISH COLUMBIA

(Special Correspondence.)—The Le Roi mine, which only a few years ago was the leading gold-copper mine of this camp, and which has produced millions of dollars worth of ore, is now offered for sale by the liquidator, A. J. McMillan, of Rossland. There is a large quantity of low-grade ore still in the mine, which should average about $10 per ton in gold, silver, and copper. When it is considered that the Boundary mining companies are taking out $3 ore, it will be seen that there are possibilities for the Le Roi. The engineers state that it would take several hundred thousand dollars to prospect for ore that is of a better grade than that now blocked out. It is reported that the Great Northern railroad may interest itself in the property, benefiting by the long haul to Grand Forks and the business the operation of the mine would create. It is also thought that either the Consolidated, or Le Roi No. 2, Ltd., of Rossland, could work this property to advantage.——Work on the Blue Bird mine is resulting in important ore discoveries. At 45 ft. depth in the main shaft 30 in. of solid galena has been found. A shaft-house is being built and the working force augmented. ——The September report of the Le Roi No. 2, Ltd., shows receipts from Trail smelter amounting to $44,603, covering 2364 tons ore and 82 tons concentrate. Expenditure for development, ore production, and mill operations was $19,350. New work on the Surprise property consists of 19-ft. drift, 24-ft. winze. The 1300-ft. level was advanced 127 ft., of which 30 ft. assayed 34 gr. gold and 1% copper.

Rossland, October 25.

(Special Correspondence.)—Ore shipments from the Rawhide mine of the New Dominion Copper Co. to the Greenwood smelter have increased from 1100 to 3000 tons per week in the past month. The net earnings of the British Columbia Copper Co. for September amounted to $27,600. Copper was produced at a cost of 8.3 cents, a slight increase over August, when this cost was 7.7 after making the usual deductions for gold and silver. The three furnaces are in operation.——The Tip Top mine, near Greenwood, is again in operation, five men being employed. Work has also been resumed at the Bay property. It is the intention to make shipments over the snow roads this winter. At the Napoleon mine the B. C. Copper Co. has 60 teams and scrapers stripping.——The ore shipments from the Boundary district for the week ended October 22 were 28,445 tons.

Phoenix, October 26.

MEXICO

OAXACA

(Special Correspondence.)—Among the resident mining men it is well known that there is more activity in mining matters than is supposed by the public. This camp passed through a boom three to five years ago, when money was plentiful and mining claims were held at ridiculously high figures. As is usual in such times, there was little work of merit being done. Wild-catting was the order of things and fortunes changed hands in short time. At present there is more ore being taken out than in Oaxaca's palmy days. The workers of early years have left their marks, and their work can be traced in places, the most interesting probably being the wooden stamps and wheel-transmission of the early English, some of which are still in fair condition. At present the San Juan, Purisima, Esperanza, Sanford, Veronica, Rosario, Escuadra, and a number of other properties in Taviche district are shipping ore. In the Sierra Juarez district, aside from the Natividad mines, possibly the best known in the State, the Colonial Mines Co., of Boston, the Old Mexico Mining Co., of New York, the various properties of Maurice Clark, and others, are being operated with good results. In the Totolapam districts the La Leona mine and mill, the Soledad Mining Co., Harold Sturgis, La Victoria y Tapada mines, J. L. T. Hall, and W. E. McEwen are the best known, most of which are in bonanza and are either shipping or treating the ores in local mills. In the gold belt of the Parian, Perez, and Penoles districts several mills are running, another is being erected for Sr. Montroy at Perez, and, while this is the least active of all the districts, enough returns are being received to make a good showing.——In the San José and Ejutla districts, the San Martin, operated by a Canadian company, is working full time in development; the Tezuitlan Copper Co.'s property; Los Ocotes, known to have more value in sight than any other mines in the State, and various others, are operating extensively. The La Alianza, under the management of F. M. Woods, is in bonanza and shipping ore.

Oaxaca, October 25.

CHIHUAHUA

The Palmilla mine is to put three centrifugal pumps, each of 1200 gal. capacity, on the eighth level. The pumps can be operated either singly or together as desired. The column pipe is 13 in. diameter.——It is reported that in the Guadalupe mine at Inde a body of high-grade ore has been discovered.

Personal

Professional men are invited to send notices of their engagements and travels. Such items will be inserted gratis.

C. M. Rolker is in San Francisco.

Francis Drake has gone to London.

C. K. Leith has returned from Brazil.

W. S. Noyes was at Oroville this week.

E. A. Montgomery has gone to Guanajuato, Mexico.

A. D. Meiss has been visiting San Francisco and other Western points.

R. B. Lamb has opened offices in the Traders Bank building, Toronto, Canada.

Charles D. Kardong has gone to Nicaragua. He will return about February 1.

G. H. Cady is at Urbana, Illinois, this winter with the State Geological Survey.

Norman C. Stines has been in Berlin and London and will be in New York next week.

John Gross, of Draper & Gross, has gone to Sonora, Mexico, on professional business.

Jesse J. MacDonald has gone to Bluff, Utah. He will return to Los Angeles December 1.

H. H. Webb is at Porcupine, Ontario, managing the Rea mines for the Consolidated Gold Fields of S. A., Limited.

Mark R. Lamb left on October 25 for an extended commercial journey in South America for Allis Chalmers Company.

N. Y. Tri Schkoff, manager of the Blagodatny mines and smelter at Ekaterinburg, Russia, was in San Francisco this week.

Morton Webber has returned to New York from North Carolina, where he has been examining mines for New York clients.

Rush M. Hess has left the service of Cia. de Real del Monte y Pachuca to become engineer for the South American Mines Co., Guayaquil, Ecuador.

O. F. Westlund, formerly manager for the A. S. & R. Co. of the Aguas Callentes smelter, is general manager in Mexico for the Mines Management Co. of New York. His office is at Num. 48, Avenida 16 de Septembre, Mexico City.

G. E. Webber, who has been associated with H. Eckstein & Co. for seventeen years, has resigned as general manager of the Rand Mines, Ltd. He will remain at Johannesburg until April, after which his American friends hope to see him at home.

OCTOBER COPPER REVIEW.

By M. E. Appelbaum*

During the month of October the price of copper rose from 12½c. delivered thirty days, to 12⅞c. delivered thirty days, and the buying for both domestic and export trade assumed large proportions. In fact, more copper was sold during the month of October than in any month during the last half year. The advance was principally due to the more favorable European statistics and to the large decrease in the surplus reported by the Copper Producers Association. In that report the production for the first time showed the effect of the curtailment policy, and the statistics for the month of October are expected to show a still further falling off. I estimate deliveries for the month of October to be about 67,000,000 lb. each for export and domestic trade, against a production of about 112,000,000 lb., thus indicating a decrease of about 22,000,000 lb. The key to the metal situation lies with the railroads, which, it is expected, will have to order large equipment. If these orders materialize and the curtailment policy continues, it is confidently expected that the metal will continue to advance gradually, and it will not be surprising before long to see a 13½c. level established.

*President the New York Metal Selling Company.

Market Reports

LOCAL METAL PRICES

San Francisco, November 3

Antimony	12–12½c	Quicksilver, flask	42½–46
Electrolytic Copper	14⅝–14¾	Tin	39½–40
Pig Lead	4.50–4.75	Spelter	5–5½

Zinc dust, 100 lb casks, per 100 lb, small lots 7.50–8.75, large 6.50–8.50

METAL PRICES

By wire from New York

Average daily prices in cents per pound.

Date.	Electrolytic Copper	Lead	Spelter.	Silver, per oz.
Oct. 27	12.65	4.40	5.84	56⅛
" 28	12.65	4.40	5.84	55¾
" 29	12.65	4.40	5.84	55⅝
" 30	Sunday.		No market.	
" 31	12.68	4.40	5.85	56
Nov. 1	12.68	4.40	5.88	56
" 2	12.68	4.40	5.88	56

ANGLO-AMERICAN SHARES

Cabled from London

	Oct. 27. £ s. d.	Nov. 2. £ s. d.
Camp Bird	1 11 6	1 11 6
El Oro	1 6 3	1 6 3
Esperanza	2 0 9	2 0 9
Dolores	1 5 0	1 5 0
Oroville Dredging	0 7 0	0 7 0
Mexico Mines	7 10 0	7 10 0
Tomboy	0 18 1⅝	0 18 1⅝

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Nov. 3.		Closing prices, Nov. 3.
Adventure	$ 8⅞	Mohawk	$ 51½
Allouez	45	North Butte	76¾
Atlantic	8¾	Old Dominion	42
Calumet & Arizona	57	Osceola	133½
Calumet & Hecla	560	Parrot	14¼
Centennial	22	Santa Fe	1⅛
Copper Range	72	Shannon	14
Daly West	37⅛	Superior & Pittsburg	14⅜
Franklin	11½	Tamarack	61
Granby	38	Trinity	6
Greene Cananea, ctf	7½	Utah Con	26
Isle-Royale	23⅜	Victoria	2⅞
La Salle	11	Winona	10⅛
Mass Copper	9¼	Wolverine	132

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Nov. 2.		Closing prices, Nov. 2.
Amalgamated Copper	$ 70⅛	Miami Copper	$ 20⅛
A. S. & R. Co.	80⅜	Mines Co. of America	6¾
Braden Copper	4⅛	Montgomery-Shoshone	⅛
B. C. Copper Co.	6⅞	Nevada Con	20⅜
Butte Coalition	19¼	Nevada Utah	1¼
Chino	21¼	Nipissing	11⅛
Davis Daly	1⅞	Ohio Copper	1¾
Dolores	5¼	Ray Central	1⅜
El Rayo	3⅝	Ray Con	20⅜
Ely Central	3/16	South Utah	1⅜
First National	3⅛	Superior & Pittsburg	13¼
Giroux	7⅛	Tenn. Copper	37⅛
Guanajuato Con	¾	Trinity	6
Inspiration	9	Tuolumne Copper	3⅝
Kerr Lake	6½	United Copper	5⅜
La Rose	4⅞	Utah Copper	48½
Mason Valley	9⅞	Yukon Gold	3⅞

SOUTHERN NEVADA STOCKS.

San Francisco, November 3.

Atlanta	$ 13	Mayflower	$ 5
Belmont	4.50	Midway	19
Booth	8	Montana Tonopah	95
Columbia Mtn	4	Nevada Hills	2.40
Combination Fraction	30	Pittsburg Silver Peak	62
Fairview Eagle	40	Rawhide Coalition	6
Florence	1.95	Rawhide Queen	—
Goldfield Con	8.25	Round Mountain	37
Gold Kewenas	6	Silver Pick	7
Great Bend	3	St. Ives	17
Jim Butler	30	Tonopah Extension	1.05
Jumbo Extension	28	Tonopah of Nevada	8.35
MacNamara	29	West End	52

(By courtesy of San Francisco Stock Exchange.)

COMSTOCKS

San Francisco, November 3.

Alpha	$ 3	Hale & Norcross	$ 18
Alta	10	Julia	7
Andes	8	Justice	10
Belcher	60	Kentuck	10
Brunswick Chollar	23	Mexican	1.20
Brunswick Potosi	21	Occidental	42
Bullion	[illegible]	Ophir	1.27½
Caledonia	18	Overman	30
Cassidy	[illegible]	Potosi	[illegible]
Challenge Con	18	Savage	11
Chollar	8	Scorpion	[illegible]
Confidence	70	Seg. Belcher	10
Con. Imperial	3	Sierra Nevada	19
Con. Virginia	1.05	Silver Hill	5
Crown Point	60	Union	25
Exchequer	[illegible]	Utah	5
Gould & Curry	10	Yellow Jacket	43

(By courtesy of San Francisco Stock Exchange.)

OIL SHARES

San Francisco, November 3.

Alma	$ 1.00	Occidental	$ 20
Apollo	8	Palmer	1.35
Associated Oil	43.75	Paraffine	90
Bay City (New Stock)	50	Pinal	4.75
Brookshire	1.12	Premier	75
Caribou (New Stock)	1.45	Record	6.00
Claremont	1.50	Republic	53
De Luxe	1.00	Sauer Dough	2.00
Empire	3.00	Silver Tip	1.50
Enos	1.05	S. W. & B.	35
Fulton	1.50	Sterling	2.00
Illinois Crude	44	Turner	1.25
Jade	20	Wolverine	40
Monte Cristo	2.60	W. K. Oil	2.40
Nevada Midway	17	Yellowstone	[illegible]

(By courtesy of San Francisco Stock Exchange.)

CURRENT PRICES FOR ORES AND MINERALS

(Corrected monthly by Atkins, Kroll & Co.)

The prices are approximate, subject to fluctuation, and to variation according to quantity, quality, and delivery required. They are quoted, except as noted, f.o.b. San Francisco. Buying prices marked*.

	Min.	Max.
Antimony ore, 50%, per ton	*$20.00	$25.00
Arsenic, white, refined, per lb	0.03	0.03½
Arsenic, red, refined, per lb	0.08	0.09
Asbestos, according to length and quality of fibre, per ton	100.00	350.00
Asbestos, lower grades, per ton	10.00	100.00
Asphaltum, refined, per ton	15.00	20.00
Barium carbonate, precipitated, per ton	42.50	45.00
Barium chloride, commercial, per ton	42.50	47.50
Barium sulphate (barytes), prepared, ton	20.00	30.00
Bismuth ore, 10% upward, per ton	*75.00	upward
Chrome ore, according to quality, per ton	10.00	15.00
China clay, per ton	15.00	20.00
Cobalt metal, refined, f.o.b. London, per lb	2.50	
Coke, foundry, per 2240 lb	15.00	17.50
Diamonds:		
Borts, according to size and quality, per carat	2.00	15.00
Carbons, according to size and quality, per carat	75.00	100.00
Feldspar, per ton	5.00	25.00
Firebrick:		
Bauxite, per M	175.00	200.00
Magnesite, per M	200.00	250.00
Silica, per M	47.50	
Flint pebbles for tube-mills, per 2240 lb	15.00	25.00
Fluorspar, per ton	10.00	15.00
Fullers earth, according to quality, per ton	20.00	30.00
Gilsonite, per ton	32.50	45.00
Graphite:		
Amorphous, per lb	0.01	0.02½
Crystalline, per lb	0.04	0.13
Gypsum, per ton	7.50	10.00
Infusorial earth, per ton	10.00	15.00
Magnesite, crude, per ton	7.50	10.00
Magnesite, dead calcined, per ton	22.50	27.50
Magnesite, brick (see firebrick).		
Manganese ore, oxide, crude, per ton	10.00	25.00
Manganese, prepared, according to quality, per ton	45.00	125.00
Mica, according to size and quality, per lb	0.05	0.30
Molybdenite, 95% MoS_2, per ton	400.00	500.00
Monazite sand (5% thoria), per ton	150.00	200.00
Nickel metal, refined, per lb	0.45	0.60
Ochre, extra strength, levigated, per lb	0.02½	0.03½
Platinum, native, crude, per oz	*20.00	25.00
Scheelite (see tungsten ore).		
Sulphur, crude, per ton	15.00	25.00
Talc, prepared, according to quality, per ton	20.00	50.00
Tin ore, 70%, per ton	*400.00	450.00
Tungsten ore, 65%, per ton	*475.00	520.00
Vanadium ore, 15%, per ton	*100.00	125.00
Wolframite (see tungsten ore).		
Zinc ore, 50% up, per ton	*15.00	20.00
Zinc oxide, per 100 lb	7.50	8.50

CURRENT PRICES FOR CHEMICALS

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as specified. For round lots lower prices may be expected, while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min.	Max.
Acid, sulphuric, com'l, 66°, drums, 100 lb	$0.90	$1.25
Acid, sulphuric, com'l, 66°, carboy, 100 lb	1.00	1.50
Acid, sulphuric, C.P., 9-lb. bottle, bbl., lb	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb	0.09½	0.12
Acid, muriatic, com'l, carboy, 100 lb	1.60	2.00
Acid, muriatic, C.P., 6-lb. bottle, bbl., lb	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb	5.25	6.50
Acid, nitric, C.P., 7-lb. bottle, bbl., lb	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb	0.12½	0.15
Argols, ground, bbl., lb	0.20	0.25
Borax, cryst. and conc., bags, 100 lb	2.75	3.85
Borax, powdered, bbl., 100 lb	3.00	4.00
Borax glass, gd., 30 mesh, cases, 100 lb., tin lined	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb	4.50	5.50
Bromine, 1-lb. bottle, lb	0.55	0.65
Candles, adamantine, 12 oz., 40 sets to case	3.50	4.15
Candles, adamantine, 14 oz., 40 sets to case	4.00	4.55
Candles, Stearic, 12 oz., 40 sets to case	4.95	5.50
Candles, Stearic, 14 oz., 40 sets to case	4.65	5.20
Clay, fire, sack, 100 lb	1.50	2.00
Cyanide, 98 to 100%, 100-lb. case, lb	0.20¾	0.24¾
Cyanide, 98 to 100%, 200-lb. case, lb	0.20	0.24
Cyanide, 125 to 127%, 100-lb. case, lb	0.27½	0.28½
Cyanide, 125 to 127%, 200-lb. case, lb	0.26¾	0.27½
Lead acetate, brown, broken casks, 100 lb	8.75	9.00
Lead acetate, white, broken casks, 100 lb	10.00	10.25
Lead acetate, white, crystals, 100 lb	11.75	12.25
Lead, C.P., test., gran., 100 lb	13.00	15.00
Lead, C.P., sheet, 100 lb	15.00	18.00
Litharge, C.P., silver free, 100 lb	10.50	13.00
Litharge, com'l, 100 lb	7.50	9.00
Manganese ox., blk., dom. in bags, ton	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton (85% MNO_2—¾% Fe)	45.00	50.00
Nitre, double ref'd, small cryst., bbl., 100 lb	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb	7.25	18.00
Potassium bicarbonate, cryst., 100 lb	12.00	15.00
Potassium carbonate, calcined, 100 lb	15.00	18.00
Potassium permanganate, drum, lb	0.11	0.12½
Silica, powdered, bags, lb	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb	1.50	1.75
Soda, bicarbonate, bbl., 100 lb	2.00	2.50
Soda, caustic, ground, 98%, bbl., 100 lb	3.15	3.50
Soda, caustic, solid, 98%, bbl., 100 lb	2.65	2.85
Zinc shavings, 800 fine, bbl., 100 lb	10.75	11.75
Zinc sheet, No. 9—18 by 84, drum, 100 lb	9.75	10.75

Tin shipments from the Straits settlements for the first half of October, according to L. Vogelstein & Co., were reported by cable as approximately 2000 tons, about 4300 tons being estimated for the entire month. As October is not a 'banca sale' month, and assuming that United States deliveries will again be good, a considerable shrinkage in the visible supply is indicated. Even so, if the present market is maintained values will appear high. There is, however, no relation between stocks and prices. During the first 10 months of this year the visible supply will have decreased between 5000 and 6000 tons; surplus stocks are closely held in strong hands and demand continues equal to if not in excess of supply. Under such circumstances control of stocks means control of the market and we still hold that "in the absence of forced liquidation we see no reason to apprehend lower prices and of forced liquidation there is no prospect." (See our letter of August 13). The Syndicate's operations naturally attract tin to London. Yet there was in store and to arrive at that port October 1, only 1000 tons more than at the same time a year ago.

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ROBINS BELT CONVEYOR

THE Engineering Staff of the Robins Company have been successfully solving conveying problems for fourteen years and the benefit of their experience is at your command.

One of the many adaptations of a Robins Belt Conveyor for Mining and Smelting Work is illustrated below. The conveyor receives ore from the bins through a traveling shaker feeder which may be seen in front of one of the farther bins. Correspondence in reference to your conveying problems is invited.

ROBINS CONVEYING BELT COMPANY—NEW YORK—CHICAGO—SAN FRANCISCO

THE PIONEER MINING MACHINERY HOUSE OF THE WEST.

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EDITORIAL

DECREASES in visible stocks of copper, tin, and spelter are all reported. This can only mean better prices, whether it be due to increased consumption or curtailment of production.

COLORADO is interested in the announcement that a new railway is to be built from the main line of the Denver & Rio Grande near Newcastle, north into Rio Blanco county and ultimately, it is hoped, to Utah. The projected railroad will open important coal and oilfields. Gilsonite and carnotite deposits also occur in the territory to be traversed.

NOME suffered November 3 from a disastrous flood due to heavy surf driven over the sand spit and through the lower part of the city. No one was killed, but there were heavy losses in provisions and other property, ruined or carried away to sea. It is suggested that the tidal wave was caused by submarine disturbances connected with the recent volcanic activity of Mount Bogoslof and Mount Shishaldin.

ZINC-SMELTING conditions have changed radically in the last year. Several months ago we presented a careful analysis of the situation by Mr. R. G. Hall, manager of the United Zinc & Chemical Company, indicating that a shortage in spelter was to be expected this winter. The pinch is already slightly felt, and with increasing cold weather and resulting demand on the Kansas gasfields, may be expected to be intensified.

SUBSCRIBERS and others frequently write to us, but neglect to sign their names, or else use an assumed signature. This is probably due to a misunderstanding. It is impossible to pay any attention to letters unless the genuine name of the sender is attached. This is not necessarily for publication, indeed there is rarely any objection to the use of a pen name for that purpose when it is preferred, but the Editor must have some evidence of the good faith of the correspondent. Aside from that, it is often simpler to answer by letter than through the columns of the paper. This is impossible unless the correct name and address be given.

OIL MEN from all parts of California are expected to meet at Bakersfield today and attempt to get together in their requests for modification of recent rulings of the Land Office. The major difficulty lies in the requirement that discovery shall be made prior to location. It could ordinarily be met by prompt re-location after discovery. In the areas covered by withdrawals this is now impossible,

and in effect the ruling, however well founded, operates to defeat the law that was intended to permit patents to issue to those who had located lands prior to withdrawal and have proceeded in good faith to develop them. The injustice of this is so apparent that it can hardly be doubted that some means will be found by the Department to modify the rules so as to carry out the intent of the law.

EARLY returns from the election indicate large Democratic gains. Election of Mr. Woodrow Wilson to be Governor of New Jersey and re-election of Mr. Judson Harmon in Ohio are especially noteworthy and are causes for congratulation. In New York, Mr. John A. Dix has been elected, greatly to the delight of Wall Street, which, as our correspondent states, was a unit on 'anything to beat Roosevelt.' It is interesting to recall that until Mr. Roosevelt entered the campaign few had any hopes of electing a Republican successor to Mr. C. E. Hughes as Governor. In California, Kansas, and other States the progressive Republicans won notable victories, though in Indiana and elsewhere they were defeated. On the whole, the results are not clearly decisive. The new issues have not yet brought out new leaders with nation-wide followings.

THE RECLAMATION SERVICE is engaged in construction work of first importance. It has not hesitated to attempt doing new things or adopting new methods. To engineers one of the most interesting phases of its work has been the large amount of construction carried out on force account and the small amount of contract work done. The showing presented on another page is greatly to the advantage of the force-account system. The same result followed from its introduction on the Los Angeles aqueduct work and must follow wherever conditions permit honest and capable supervision. Contractors naturally, and properly, estimate to cover the maximum risk, and there must be contractors' profits or the business would not continue. Capable assistants and foremen can be found to work directly under the engineers as well as under a contractor, and if such men are not employed something is wrong. Incidentally it may be remarked that the substitution of force account for contract work lies at the bottom of some of the criticism of the Reclamation Service.

THE PONDEROSA copper mine in the Collahuasi district of Chile is one that is well known for the great body of high-grade ore present. When the property was purchased by the Ponderosa Mining Co., Ltd., from the Chilean company that opened the mine, it was estimated that 100,000 tons of ore containing 25 per cent copper and 12 ounces silver per ton was developed. The new company started under apparently good auspices and in July 1909 paid a five per cent dividend, amounting to £26,458. Soon, however, there were rumors of trouble, though details were not made public. The manager and several members of the Board resigned and a new administration came in charge. It promptly became clear that the payment of the dividend had not been warranted. The mine is situated at high altitude and the engineers evidently have great difficulties to overcome. At the same time, the cost of production, and the fact that there was a deficit rather than profit after 25,782 tons had been sold, are surprising in view of the value of the ore. That shipped in 1909 averaged 22 per cent copper and 6½ ounces silver and brought £181,211. The cost of mining is stated to have been £188,253, including £40,489 for transportation, but not including £7487 for development, £6069 allowed for depreciation, and £16,945 for management in London and at the mine. In the absence of complete data it is difficult to determine what has been included under the item of management, and why the cost should have been so high. It would appear that there was either poor work or poor bookkeeping.

Mapping South America

Maps are among the important but little considered adjuncts of civilization. They are essential to any complete development of a territory. All the great nations maintain bureaus for making surveys and publishing maps. Most of them support geological surveys whose special function it is to make maps showing the distribution of different formations. At first each country established its own scale and each geologist used any color scheme that met his fancy. Gradually a measure of uniformity has been brought about, largely through the activity of the International Geological Congress. This has many points of practical advantage. An engineer may be wholly ignorant of Russian or Japanese and yet be able to read the excellent geological maps published in those countries. This is possible because according to the international scheme, Carboniferous rocks are represented by various shades of blue, Cretaceous by green, Tertiary by yellow, and a different color is assigned to each system. Some years ago arrangements were made by the leading European Governments to co-operate in producing a great map of Europe on a uniform scale of one to one million, and many sheets of this have now been issued. Later the United States, Canada, and Mexico became parties to the agreement, and the preparation of a world map is now in progress. Mr. Bailey Willis, well known for his excellent work in connection with the United States Geological Survey and for his monumental 'Research in China,' has now enlisted the support of the leading South American nations. New and extensive surveys are to be undertaken in Argentina, Chile, Brazil, and Peru, and doubtless later in other countries. Mr. Willis has been invited to organize the work in Argentina by the Government of that country, and arrangements have been made at Washington for him to do so. Aside from the eminently practical results likely to ensue from the making of the surveys, this is a form of co-operation between the United States and South American republics that deserves hearty approval. The people of the two continents need more contact on the intellectual plane. Attention should not be devoted too narrowly toward promoting commercial relations. American geologists have rendered dis-

[illegible] engineering service in South America. Messrs. C. Hartt O. A. Derby and J. C. [illegible] White in that country and in Venezuela, G. I. Adams in Peru and many others have contributed to the solution of the scientific and economic problems of our great South American neighbors. Mr. Willis is an especially fit man to carry on the work already begun and to extend and reorganize it as the need arises.

Railways and Politics

One of the beneficial results of the election held this week will doubtless be further decrease in the political activities of railways and other large corporations. There was a time when each great railway system in the United States supported a political bureau, and when, under the guise of local attorneys and tax commissioners, men were maintained in each community to look after the political interests of the road. Senators were made and unmade, Congressmen selected, and even local petty officials picked out on the basis of their faithfulness to the railway political machine. This is an open secret to anyone familiar with the practical workings of politics in almost any American State in the last twenty years. The evil effects of having political action controlled by special interests have been many. However honestly a railway manager may have desired only to protect the legitimate interests of his stockholders, he has been forced inevitably into alliance with all that was corrupt in our political system. The henchmen of the corporations have been the crooks and the grafters. It has been entirely too common in discussing the matter to heap condemnation on the railways without a fair consideration of the conditions that made activity in politics a practical necessity on the part of any manager who would do his duty by his stockholders. Not that the railway managers have been free from blame. They have been producers as well as victims of the conditions, and on the whole have profited rather than lost. At the same time the blame rightly should rest in most cases on the community at large as well as on the conspicuous offenders. The situation in California may be used to illustrate what has been common elsewhere as well as on the Pacific Coast. Essentially it is a matter of taxes and the very human desire not to pay more, and if possible to escape with less, than one's neighbor. In California certain items of railway property have been assessed by a State board and others by local assessors. In the nature of the case a local official, familiar with the price of farm land and cattle, is not a competent judge of the value of railway property. The most expert would have difficulty enough since practically the largest value in any railway system is the intangible 'good will' or earning capacity incident to going concerns. The amount to be assessed therefore has been largely discretionary, and railways under these conditions have been forced to use every effort to secure election of assessors not unfriendly to them. Though more conspicuous, the problem is the same as in a county where both mining and [illegible] are important. A farmer elected to the position of assessor is not known to be elected [illegible] so that the farmer's knowledge of taxes bears on mines and while we have high respect for men engaged in mining we have no doubt that a miner as assessor would see more value in farm lands than would a farmer. The railways have labored under another disadvantage, in that they and other public service corporations have been open to attack through many dishonest bills introduced in legislatures with no other purpose than that those backing them should be bribed.

Wise managers have long realized the difficulties of the situation and many have made determined efforts to escape. The Colorado Fuel & Iron Company, long a most important factor in Colorado politics, at one time cut off all support from its political henchmen. Their years of activity had, however, built up an organization that lived on the spoils of corrupt politics, so that the company was forced to abandon for the time the effort toward righteousness. In California the activity of the Southern Pacific in politics has continued so long that it has been accepted as one of the fixed facts. Mr. Otto H. Kuhn in a recent interview has announced that the railroad will no longer support a political bureau, but will devote itself to its legitimate function of furnishing transportation. This announcement has been received with smiles of incredulity, since similar declarations have been made before. There need, however, be no doubt as to the desire of the owners of the system to stay out of politics, and in the primary and general elections the complete defeat of the old crowd indicates that the people are equally in favor of a new order of things. Fortunately there is reason for believing that a change is possible. Adoption of the constitutional amendment separating State from local taxation and changing the method of assessing corporation property, removes the main underlying difficulty—that of taxes. The railway and other large corporations will hereafter be taxed only by and for the State and being independent of local assessors, will have no interest in the election or defeat of particular candidates. In determining the amount to be paid as State taxes a simple mathematical rule is also substituted for the old discretionary authority. Railways, for example, are to pay four per cent of their gross receipts. Since this calculation can be made with equal certainty by a Republican or Democrat, an honest man or a grafter, the corporations no longer need look to the election of men to represent them in the State Board of Equalization. In many minor ways the condition has been improved. The way is open to better things. There will still be uninformed and dishonest men elected to the legislature and to other important positions, but in the main the underlying need for the railway to be in politics has disappeared and honest managers can hereafter devote themselves to their legitimate business if they wish. It is hopeless to attempt to make men honest by law, but each community owes it to all the individuals therein, corporate as well as others, to establish conditions under which honesty is possible.

Failure of the Yuba River Debris Barrier

By H. H. Wadsworth

*The structure on the Yuba river, California, commonly known as 'The Barrier' was one of those forming the system of works to restrain the movement of hydraulic mining débris down the Yuba into the Feather and Sacramento rivers. Some portions of this system are in operation, and others are in course of construction. The barrier failed on the night of March 17 and 18, 1907, during the unprecedented flood that set new standards as to flood heights and stream flow, of the Sacramento river and all its tributaries, for engineers dealing with reclamation and flood control problems.

Two steps of the dam were built, 6 and 8 ft., respectively, making a total of 14 ft. above what was the bed of the river when the first step was built. The first step was backed by tailing on the ocurrence of the first high water after its completion. Likewise, during the first flood following the completion of the second step, tailing banked up to its crest, and subsequent high waters carried large quantities of gravel over the dam, which caused considerable wear on the concrete surface. At the same time, the water, with its increased velocity, due to its drop, caused extensive scour at the toe. In 1906, it was decided not to raise the dam by an additional step, but to devote all the energy possible to excavating a spillway and constructing the side-wall, and to increasing the output of the quarry to a maximum for use in toe protection.

The Yuba river, the flow of which ranges from a minimum of about 400 sec.-ft. in summer to a maximum of 125,000 sec.-ft. during extreme floods, maintained, during May and June and well on into July 1906, a flow of between 10,000 and 20,000 sec.-ft. On account of the arrest of the passage of débris by the dam, which would continue to be effective, though in lessening degree, until the accumulation above it had been built up to a slope approximately parallel to the former slope of the river bed (about 19 ft. per mile at this point), the flowing water, thus relieved of its load above the dam, was able to pick up a new load below and scour out a channel downstream from the dam sufficient to prevent a water cushion from forming there, which would have served as some protection against further undermining action. Of more than 5000 tons of large rock placed at the toe of the barrier in 1905, comparatively little remained in sight by June of the next year, the scouring action having buried it in the gravel. The depth to which scouring extended was in some places as great as 12 ft. The undermining of the gravel from behind the plank bulkheading of the first row of piles extended back under the dam irregularly, in some places as far as 4 ft. The surface of the river above the dam was 25 ft. above the lower part of the undermined face, but the fact that there was little or no evidence of seepage showed the density of this natural hydraulic fill. During the summer of 1906 this cavity was filled with rock placed by hand, and about 3500 tons of large rock was added to the rock apron, the theory on which this work was continued being that, as the high-water periods during which excessive erosion occurred were separated by several months' time, it would be possible after each flood to restore the settled rock fill to grade by the addition of new material, and that this process could be continued until the barrier had been raised to its final height. On reaching this point, the spillway, as designed, would have sufficient capacity to carry the entire flow of the river except during a very few days each year. How vital to the maintenance of the barrier the construction of the spillway was recognized to be, is shown by the following consideration. The nearest down-stream point which would limit positively the depth of scour above it was at Daguerre Point cut, 6 miles away, the sill of which was at El. 125. The concrete apron at the toe of the barrier was at El. 195. If, by reason of holding back the supply of gravel above, the scour continued below until a slope as flat as 8 ft. per mile up from Daguerre Point was reached, it would then have stood 36 ft. above the bed of the river. The projected height would thus have been reached, but by building downward rather than upward. Bedrock in the old channel of the river is probably at about El. 140, or 55 ft. below the concrete apron of the dam.

During 1906, in addition to repairing the damage at the toe and placing the large rock previously mentioned, a spillway 65 ft. wide (150 ft. wide at the entrance) was excavated, and a concrete side-wall for it, 320 ft. long, founded on solid rock, was built. The spillway and wall foundation required the excavation of 2500 cu. yd. of rock and 8300 cu. yd. of earth. A new railway track of 25-lb. steel rails, 3-ft. gauge, and nearly level gradient, was constructed from the barrier to the quarry (one-half mile), and cars, derricks, and an additional hoisting engine, were acquired in order that in future the Government might save the expense of the long haul of contractor's plant when a change of contractors occurred. The first step of the spillway afforded little relief in floods, but it was capable of carrying the entire dry-weather flow, and was expected to be of service in constructing additional steps to the barrier, as the difficulties in making the closure and turning the water over the completed structure when the first, and to a much less extent, when the second step was built, would be avoided. By the time the work of 1906 had been completed the engineers in charge of the Yuba River work had become convinced that the attempt to increase materially the storage of débris by raising the barrier several additional steps, as planned, would be hazardous to the structure until a spillway of the full capacity finally contemplated had been constructed. It may be well to note that the usual risk to interests along a watercourse below a reservoir dam of questionable stability did not exist here, because at no time was

*Paper to be presented to the Amer. Soc. C. E., November 16. Abstracted by permission.

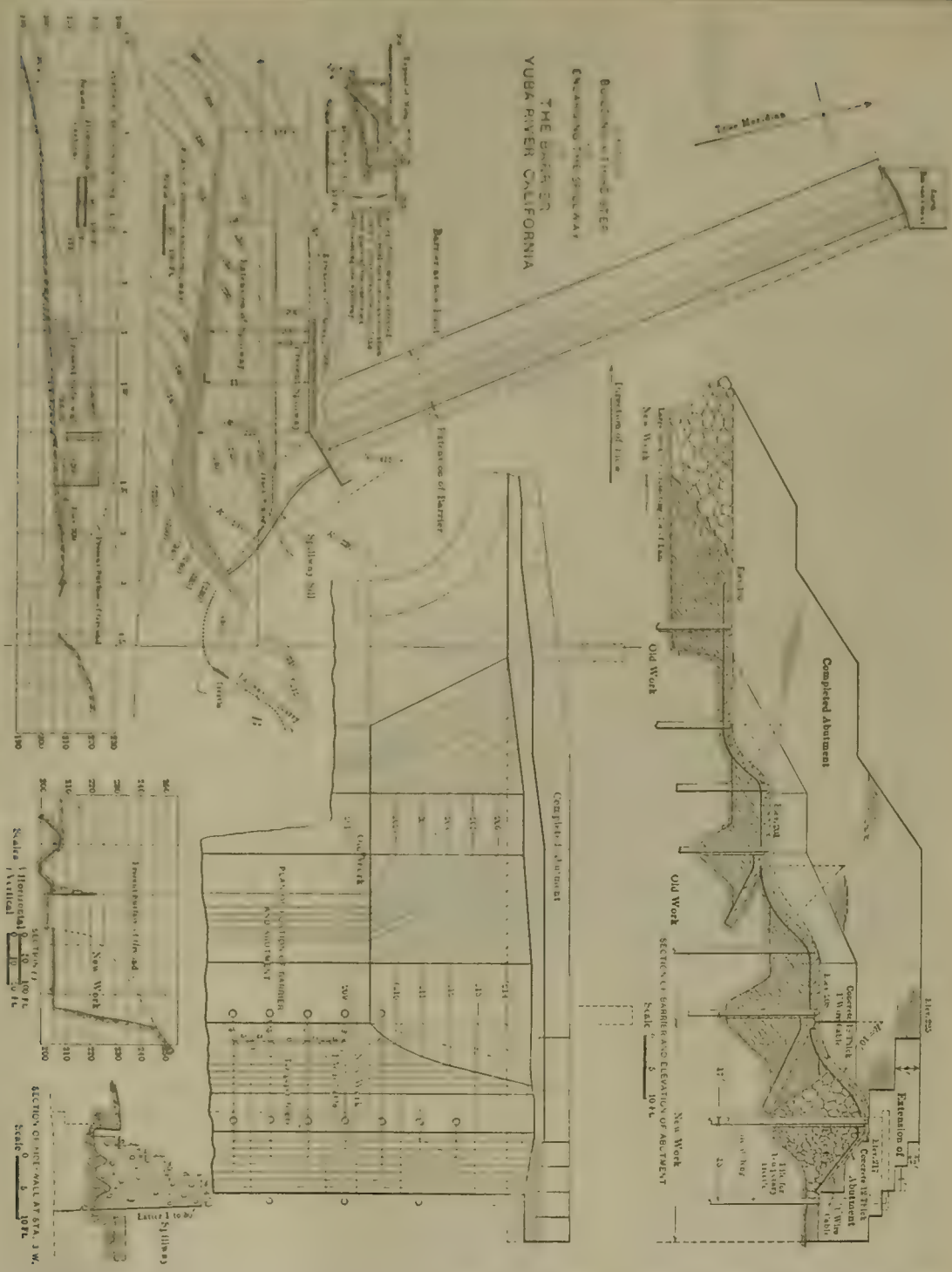


Fig. 1. Plans and Cross-Section.

any considerable volume of water impounded. In designing the several Yuba River works, the maximum flow had been assumed at 125,000 sec.-ft., which was from 25 to 50% greater than the probable maximum, as indicated by available records. This discharge, however, was nearly, if not quite, reached during the 1907 flood. This meant a depth of water of more than 7 ft. over the 1225-ft. crest of the barrier. A flood of anything like this volume, however, continues for but a few hours, and a flow of one-quarter of that amount never continues more than a few days. The site of the spillway was a steep hillside, necessitating a much larger amount of excavation to give a cross-section sufficient to carry the desired flow of 20,000 sec.-ft. below the level of the crest of the barrier than would have been the case could the barrier have been first built to its projected height. As the further movement of large quantities of gravel over the concrete surface of the dam, already backed up to the crest, was then known to be fraught with serious consequences, it was decided to widen the spillway, without materially raising its floor, and to build one additional step to the barrier, which would increase the depth of water in the spillway by its own height and, on account of the large flow through the spillway, would

not be banked up by tailing to its crest, except possibly at its north or farther end. In order that the extensive work contemplated might be done during the season of 1907, plans were prepared and a contract let much earlier in the season than had been customary on previous contracts. On February 23 a contract was awarded for building a third step to the barrier, 8 ft. high, enlarging the spillway, extending both the spillway side-wall and the north abutment, constructing a sill across the spillway, and placing large rock at the toe of the barrier. The general plan for this work is shown in Fig. 1.

Work was started at once. The contractor made arrangements with a water company for water, to be delivered at a point above the site of the work, which would give 100-ft. head; and a plant was partly installed for making the earth excavation of the spillway by hydraulicking. The necessary stripping in the quarry was commenced. From January 31 to February 2 there was a severe storm. The flow of the river, as deduced from depths on the barrier and in the spillway, rose to 80,000 sec.-ft., and a large volume of gravel passed over the dam. The water continued to be too high to permit of a critical examination of the structure, but its appearance, as viewed from either end, did not differ noticeably after this flood from that before. In fact, the rate of scour at the toe seems to have been greater at somewhat lower stages than at maximum flood stage, the reason being that the outlet channel from the pocket eroded from below the toe was of insufficient capacity to carry the flood without backing it up to a considerable extent, thus forming a water cushion. Had this February flood been the last of the season, as might reasonably have been expected, the barrier would probably have been still standing, with but little doubt as to its permanency, as the maintenance would have been a much simpler matter after the completion of the contract then in force. However, the disastrous flood already referred to, which was of greater volume than had ever theretofore been reliably recorded, occurred in that month and during the night of March 17 and 18 about one-half of the barrier was swept away. The contractor's camp was not more than 500 ft. distant, but no one there knew of the failure until the next morning. Water marks in the vicinity showed that before failure the depth on the crest was 7.5 ft. at the south end and 6.5 ft. at the north end. When I examined the place, a few days later, the river-bed through the breach presented the same smooth gravel surface that had marked it before the barrier was started, with only one or two piles, having pieces of the wire-rope anchorage attached, projecting above the surface, about 100 ft. down stream from the line of the dam.

Either of two causes may have been immediately responsible for the failure: first, the undermining of the structure by back-lash; or, second, the wearing away of the concrete surface of the apron and first step, 18 in. thick, thus permitting the rapid washing out of the rubble rock fill. There was not time, nor did the flow of the river diminish enough between the two floods of February and March, to permit of any addition being made to the rock fill at the toe of the dam, or of any repairs to the concrete surface. Considering the conditions at the toe of the dam on the day before the failure, as reported by reliable witnesses, and the appearance of that part of the structure still standing, which adjoined the part washed out, I am convinced that the concrete surface for a considerable length was literally worn away by the great quantity of hard quartz cobbles and gravel which passes over it. Fig. 2, 3, and 4 show the conditions at the barrier at various times before and after the break.

Notes on the design of the spillway may be of interest. The stepped form of the cross-section of the side-wall is due to the fact that it was originally designed with special reference to future enlargement to the requirements of a dam 14 ft. higher than that of the modified plan. The spillway was designed to carry 20,000 sec.-ft. of water before any passed over the barrier. For different depths of water on the crest of the barrier, the total discharge of the river would be distributed approximately as follows:

Depth on barrier.	Discharge over barrier.	Discharge through spillway.	Total discharge.
0	0	20,000	20,000
1	4,400	23,300	27,700
2	13,000	25,700	38,700
3	24,000	29,300	53,300
4	38,000	30,900	68,900
5	54,000	33,400	87,400
6	71,000	36,100	107,100
7	90,000	38,600	128,600

Considering the fact that practically all the scour occurred when the depth on the crest was between 1 and 3 ft., with the spillway completed, the period of scour would be limited to a very few days, even during such a flood season as that of 1907; and it should be remembered that such a record had not been made when the spillway was planned.

The hillside through which the spillway excavation was to be made had a slope of about 1 to 5 and was of irregular formation. The south abutment of the barrier was founded on a ledge of hard blue rock, either trap or diorite. The outcropping rocks on the hillside consisted of boulders and the pinnacles which are characteristic of this region and which, below the surface, vary in character from hard trap to soft chloritic rock or serpentine, and to decomposed rock and clay. When sinking drill-holes in this formation a difference of 2 ft. in position would frequently make a difference of many feet in depth to hard rock, and even then there was no assurance that a ledge had been reached. For this reason the exact location of the sill was left indeterminate. It was to be placed as far up stream as a suitable foundation would permit. The crest of this sill, 2 ft. wide, was to be 8 ft. below the crest of the new step of the barrier. The concrete surface was then to have a drop of 1 ft., on a 45° slope, followed by a 3-ft. level surface. From this point the floor of the spillway was to have a gradient of 1.25%. The plan of the spillway and the gradient were ad-

Fig. 2. Yuba River Barrier, on October 4, 1905.

justed to give the greatest capacity for the least amount of excavation.

In addition to the work for the protection of the barrier, already described, which was in progress, a change in the form of its concrete rollway surface was contemplated in connection with the repairs to that surface which had become necessary. When there had been but one step the water followed smoothly along its ogee shape, but when the second step was constructed the increased velocity at its foot caused it to leap over the upper curve of the first, so that, with its load of gravel, it struck the lower or reverse curve well down toward the apron. The impact of the water and gravel on the concrete doubtless greatly increased the wear on the latter. A uniform slope to the down-stream face would probably have carried the gravel down with less wear, but that form was not adopted originally because less weight was given to that fact than to the reduction in the dangerously high velocities which the steps would effect. To transform the stepped face to a uniform slope would have required an excessive amount of concrete.

A study of the path of the body of water as it leaves the horizontal portion of several succeeding steps, assuming an initial velocity of 8 ft. per second, shows that, if all the energy acquired in each descent were retained, the radii of curvature of the convex portion of each step, from the top down, to be just in contact with the flowing water, would be approximately 21½, 20, and 34 ft., respectively. Assuming that 20% of the energy developed by the fall over each step be dissipated, the horizontal velocity of the water would still be such as to require radii of curvature of 21½, 16, and 25 ft., respectively, for succeeding steps. The destruction of the barrier and the decision to use the further available funds along lines which gave promise of greater efficiency in restraining the movement of débris than would the reconstruction of the barrier, put an end to further consideration of plans for its maintenance. At present, three years after, the site of the barrier presents substantially the same appearance as it did a week after the failure, except that more of the impounded tailing has washed out from the portion left when the barrier failed.

Fig. 3. Yuba River Barrier After Freshet of January, 1906. Water 1.4 ft. Deep on Crest.

Fig. 4. Near View of North End of Break.

Practically all the monazite of commerce is derived from placer or gravel deposits, all attempts to extract it from its original rock matrix having failed. The deposits were worked like placers — by sluicing and hydraulicking — and the crude monazite sand obtained is further cleaned on concentrating tables and by electromagnetic machinery, which removes its iron content.

Occurrence of Oil and Gas

By William Forstner

The main range and the upper part of the east flank of the Temblor range in the south Midway field, Kern county, California, are covered by a thick, strongly-folded belt of Middle Miocene shales. The lower portion of this belt consists of silicious and clayey shales, the upper third of diatomaceous shales, both intercalated with prominent lenses of coarse sandrock. The underlying Lower Miocene, Vaqueros sandstone, appears only at the surface on the west flank of the range. The oil is believed to have originated in the Middle Miocene diatomaceous shales, and to have migrated partly into the sandstone lenses within the shale, partly into the overlying sands, and probably partly into the underlying Vaqueros. The latter oil horizon in this district lies, however, too deep to be reached.[1] The lower part of the east flank of the range is covered by the McKittrick formation (Upper Miocene-Pliocene-Pleistocene) wherein the commercially available oil horizons of this district are contained. This formation is unconformable with the underlying Middle Miocene shales, dipping less steeply to the northeast. It consists of a series of gravels, clays, shales, and sands. The sands and gravels carry water, oil, tar, and gas, the individual beds and lenses being separated by partings of clay and shale. The water-sands are distributed throughout the formation, and are found at different levels, above, within, between, and below the two oil horizons hereinafter more specially described. They vary in position within the strata in different parts of the field, as does also the composition of the water, which generally speaking is strongly mineralized, especially in the lower strata. Two prominent oil horizons have been differentiated within the McKittrick formation. It must not be understood that these horizons or zones represent continuous strata of oil-bearing sand. They consist of strata of sandstone of varying texture intercalated with shale and clay, and these individual sandstone strata are not persistent but tabular in form. They are not all bitumen bearing, some being barren; occasionally water-sands are found in the oil horizons, especially in the upper zone; others carry oil, gas, or tar. The varying character of the sand in the oil zone is due, partly to the difference in texture, partly to the difference in the general conditions of structure prevailing in the various parts of the field. The zones are limited by more prominent beds of clay and shale.

The Upper Zone (A).—This zone is overlain by a shale belt. It consists of gas, tar, and oil sands, and occasionally some thin beds or lenses of water-sand, interbedded and separated by thicker beds of clay and shale. This zone in the Midway field, except in a part of its southeastern portion, always contains sands carrying oil in commercial quantities, especially toward its base. Underlying Zone A is a belt of blue or brown shale, from 30 to 200 ft. thick, in places containing beds of hard sand, and intercalated water-sands; these shales separate Zone A from the underlying horizon.

The Lower Zone (B).—This is the principal productive zone. It lies at the base of the McKittrick formation, and rests directly on the Middle Miocene shales. Its thickness varies from 10 to 800 ft. In its thicker part there are a number of productive sands intercalated with beds of barren sand, and shale. The sands vary from medium to coarse, with pebbles and cobblestones present. The finer grained

Fig. 1. Temblor Range at Beginning of Upper Miocene.

are generally quartz sands; the pebbles and cobbles are principally derived from granite or other crystalline rocks. In the Sunset field there are, besides, pebbles of diabase, quartzite, and black slate. The composition of these sandstones indicates that at the beginning of the Upper Miocene the crest of the Temblor range was to the west, and at a much higher altitude than at present; and was formed by rocks of Cretaceous and pre-Cretaceous age. This crest was not only eroded during the Upper Miocene and later periods, but must have sunk below the present level of the range, forming northwest-southeast fault lines along the west slope of the present range, thus explaining the surface exposures of the Vaqueros at the present foot of that slope.

The occurrence of heavy shale beds above Zone B, the quartzose sands in Zone A, overlain by another belt of shales, and the foldings in the McKittrick formation indicate strong subsequent oscillations, combined with structural disturbances. The west line of the territory as developed at present in the south part of the Midway field, runs from near the northwest corner of section 36, T. 31-22, in a general southeastern direction through this section, thence through sections 6, 8, 17, 21, 22, 26, and 25 of T. 32-23, and section 31, T. 32-24. Along this line the depth of the top of Zone B below the surface is at the northern end 1600 ft., rapidly decreasing in that section to 800 ft. going southeast, and remaining at this elevation to about section 22, and then gradually increasing until in the southeast corner of section 31, T. 32-24, it is again 1600 ft. below the surface. From this line the top of Zone B, as far as developed, dips to the northeast at an angle of about 16°, while the surface dips only 1° 30′ to 2°, causing the top of Zone B to lie deeper below the surface to the eastward.

The conditions of oil and gas occurrence within this zone, in the western part of the south Midway field can be briefly stated as follows: In sections 7, 8, 9, 16, 17, T. 32-23, the gas pressure is slight; it increases somewhat in sections 14, 15, 21, 22, and 23 of the same township, causing some sand to accompany the oil but not being strong enough

[1] For more detailed description of this field see Bull. 406, U. S. Geol. Surv., from which a number of herein following data have been compiled.

to bring the oil to the surface and make flowing wells. The pressure further increases in sections 24, 23 and 25 of same township and in the southern part of section 26 the New Richmond well yielded when first drilled sufficient gas to be used. To the south-east in sections 30 and 31 the gas pressure was apparently of no great importance. To the north in section 6, T. 32 23, and in sections 22 and 36, T. 31 22, the wells gave evidence of strong initial gas pressures. To the east the initial gas pressure increases considerably, causing the oil to flow over the top of the casing in many instances with such force as to cause gushers. This elevation of the oil to and above the surface is no doubt due to gas pressure and not to hydrostatic pressure.

Petroleum is not a homogeneous substance, but a mixture of various hydrocarbons, or series of hydrocarbons. Each of these series consists of a number of hydrocarbons, wherein the ratio of carbon and hydrogen forming the hydrocarbon molecules remains the same, but the number of atoms of carbon and hydrogen forming the molecules is different, such a series being 'polymeric'. The molecules containing the smallest number of atoms of the two elements form volatile hydrocarbons; as the number of atoms increases the hydrocarbons become liquid, and by further increase of that number solids are formed. The series of hydrocarbons which form the petroleum depend upon the conditions under which it was produced; the petroleum of paraffine base consists of a different series of hydrocarbons than those of asphalt base. Within these series the composing hydrocarbons are easily dissociated, forming at one end marsh gas and natural gas, then intermediate fluids, petroleum of various gravities; then viscous and elastic hydrocarbons; and finally solids. The refining of crude oil is based on disassociation by heat or fractional distillation. This same fractionation takes place mechanically to a certain degree when oil passes through fuller's earth, an argillaceous material, which has a great attractive power for greasy substances; water has also the power to further dissociate the petroleum.[2] During the generation of the petroleum by decomposition of organic matter in the shales, different conditions of heat and pressure occur, and even at early stages, gaseous hydrocarbon compounds and petroleum are formed. Water, especially hot oxygenated water, exerts a strong chemical influence on those hydrocarbon compounds, the free oxygen promoting the formation of the lighter hydrocarbons, and restricting the formation of the heavy, tarry hydrocarbons.[3] Bacterial decomposition may also influence the production of those compounds. It has been shown that the volatile hydrocarbons in the oil shales in the upper Mississippi Valley are either directly or indirectly caused by microscopic algea.[4] The formation of these bituminous hydrocarbon mixtures, and their accumulation into globules in the shales, took place through a long geological time, during which disturbances of the strata caused different temperatures in different parts of the shale measures where in these processes took place, especially where these structural disturbances were caused by eruptive action.

After being formed the hydrocarbon compounds were gradually squeezed out of the fine-grained shales and migrated into the adjoining more porous sandstone strata. Although shales and clays are generally referred to as impervious, it must be borne in mind that even in the shales the pore spaces average not less than 6 per cent.

The channels through which the gases and liquids move are the interstices between the grains of the rock, and the contacts of the planes of stratification and fracture. The interstices can be subdivided into three classes: (1) openings larger than those of capillary size, supercapillary openings; (2) capillary openings; (3) openings smaller than those of capillary size, subcapillary openings. Supercapillary openings are found in bedding and joint planes, in coarse sandstone, and in conglomerates. In these openings the flow of liquids is controlled by the ordinary laws of hydrokinetics, modified by the viscosity of the fluid, the regularity, size, and length of the opening. Capillary openings include the great majority of interstices between grains of sand and sandstone, many of those in conglomerate, and many of the openings caused by fracture. In these openings the velocity of flow depends upon the area and cross-section of the opening, its length, and the viscosity of the fluid. The movement is so slow that the friction of the moving fluid over the sedentary film is small, especially in long openings. Subcapillary openings include part of the interstices in coarser sediments having capillary openings, and nearly all the interstices between the grains of clays, shales, and slates. The movement of the fluid in these openings is excessively slow; under the hydrostatic pressures generally occurring in those strata the movement will be reduced to such an extent that the fluid may be considered as fixed films held by molecular attraction.[5]

The pressure exercised by the gaseous hydrocarbons probably helped the process of migration of the liquid compounds out of the shales. Gases under high pressure and at high temperature do not adhere strongly to the walls of subcapillary openings, and have small viscosity. Consequently they pass more readily through these openings. The clay and shale derived therefrom always contain water in their subcapillary interstices, entrained therein during their process of formation. The oil originates in the clay beds during the time that the latter are forming at the bottom of the sea, and as a result of the great attraction of oil for clay, the globules of oil, as they form, attach themselves to particles of clay and thus form a petroliferous mud. The migration of the water and oil out of this mud takes place during the compression of the clay which transforms the latter into shale. The overlying sandstones in which the oil and water from the

[2] Bull. 365, U. S. Geol. Survey.

[3] *Mining and Scientific Press*, Feb. 5, 1910, pp. 219-220.

[4] Bull. 294, U. S. Geol. Surv., pp. 26-27.

[5] *Economic Geology*, Vol. V, p. 516.

[6] Mono. 47, U. S. Geol. Surv., pp. 129-146.

shales accumulated, participated in this compression, and the water being less viscous than the oil, the ratio of oil to water was increased in the sandstone. That the oil and gas were not diffused throughout the entire sandstone strata can be explained by assuming that the capillary and subcapillary interstices of the surrounding fine-grained, and partly cemented sandstones anad of the shales, were filled with water, thereby completely sealing up the oil and gas in the more porous portions.[7] Within the porous strata, forming the productive horizons, there are tabular lenses, or possibly strata, of fine-grained and relatively barren sandstone, others of clay and shale, and others of coarser sandstone and conglomerate generally carrying oil and gas, exceptionally carrying water.

As already stated, gases have probably been formed contemporaneously with the oil; volatilization of the liquid hydrocarbons is steadily going on and is especially increased in presence of oxygenated atmospheric water. It must be remarked that water-sands are found only occasionally in the productive oil horizon, Zone B, but are generally found immediately underlying that zone. Natural gas, the gaseous hydrocarbon compound, is a more simple and stable product than petroleum and consequently when it is once formed is not re-converted into oil. In a sealed oil horizon the natural gas will steadily increase, although the rate of increase may be slow. The gas moving with greater ease through the rocks, and being of lighter gravity than the oil, will under ordinary circumstances gather at a higher level than the oil, and where few if any water-sands are present, as is the case in Zone B in the south Midway field. The logical occurrence will be: an upper subzone containing gas, and a lower subzone containing oil. These accumulations will take place in the tabular lenses of coarse sandstone and conglomerate: the bitumen content is less in the finer and more indurated sandstone, and in the finest and hardest sandstone, as in the clay and shale, the amount is generally so small that the rock is considered barren.

In the Midway field this productive zone is at the base of the McKittrick formation, and may be considered to belong to the lower Upper Miocene. During the later geological periods a number of successive subsidences and elevations took place, accompanied by structural displacements, causing folding of the strata, and thereby creating channels along which the fluids and gases could circulate more freely than along the interstices between the grains of the rocks. The clays and shales yielded to the pressures generally by folding; the sandstones more by fracturing. At the present time the top of Zone B is from 800 to 1600 ft. below the surface along the west line of the developed territory; but for a large portion of the time after its formation this zone was buried far deeper than at present. The bitumen was squeezed out of the clays during periods of great pressure, contemporaneous probably with the period wherein these were altered into shales. The greatest pressures were exerted close to the axes of the anticlines and synclines, and here the fissuring of the brittle sandstone increased the conditions favorable to the circulation of the bitumen, but at the same time allowed the access of atmospheric, oxygen-carrying waters, thereby increasing the conditions favorable for the formation of natural gas. Near the axis of an anticline much gas and oil of higher gravity should then be found. The water will because of its weight reach lower levels in the porous strata and accumulate toward the axis of the syncline, leaving the petroleum and the natural gas predominantly above its level. The earth's movements have, however, not been regular, and there is reason to believe that during the long lapse of time from the Upper Miocene to the present, the structure has frequently been changed. In fact the present status is the result of accumulation and dissemination during a great number of centuries under constantly varying conditions.

Within the tabular lenses wherein the oil and gas accumulated the evaporation of the oil continued. If petroleum were a homogeneous liquid this evaporation would continue until the pressure of the gas had reached the vapor pressure at the existing temperature. But, due to the heterogeneous character of petroleum and its tendency to disassociation, I think it is only safe to state that this evaporation continues until a state of equilibrium is reached. This implies that the pressure of the gas is not sufficient to drive the water out of the capillary and subcapillary interstices of the strata surrounding the locus of accumulation. It is impossible to state the pressure required in this case, because according to the formulas of capillary flow the length of the channels and their form are controlling factors, and both are constantly varying throughout any stratum. Assuming a gas pressure of 1000 lb. per sq. in., the largest diameter of capillary openings, with a straight channel through 100 ft. of sand strata, and a temperature of 80° F., the gas pressure would be held in equilibrium by a hydrostatic pressure of 2000 ft., without taking into consideration any friction resistance in the latter column. As the flow of water through capillary openings is greatly reduced by the variation in cross-section of the capillary openings it is readily seen that the sealing of the oil and gas accumulations by the water filling the interstices of the surrounding strata, is complete at a much shallower depth. It may be that in those portions where heavy pressures, from 600 to 1000 lb. per sq. in. exist, the gaseous hydrocarbons have been compressed into liquid form.[8] If this view is correct, the pressures which caused the liquefaction of the natural gas must have been greater than the vapor pressure, and must have occurred subsequent to the formation of that gas. They must have been caused by a compression of the strata which reduced their interstices, probably accompanied with induration of at least part of them by cementation. That such can have occurred during post Middle Miocene times is probable.

The assumption that in the productive oil horizon there are large tabular lenses, wherein the oil accumulates under gas pressures varying in the different

[7] *Economic Geology*, Vol. IV, pp. 517-527.

[8] *Mining and Scientific Press*, June 11, 1910, p. 857.

pools is therefore justified. In each individual pool the material will vary in coarseness and the gas pressure will therefore vary in its different parts. When because of the completion of a well in such a pool the oil starts to move therein the gas pressure will be equalized throughout the pool, and if the well reach the pool in a portion where the gas pressure is lower it is reasonable to suppose that at the well the pressure may, after a lapse of time, increase the movement of the oil in the pool toward the wells creating channels through which the gas in the pool can accommodate itself to the tendency of equalization of pressure. That the wells drilled formerly along the west side of the south Midway field showed no gas pressure can be readily explained by the fact that these wells are close to the axis of the Spellacy Hill anticline, and the fissuring of the strata along this axis allowed the gases under high pressure to escape.

Every theory must receive its final test of comparison between deduction and fact. In this case the geologist meets great difficulties in obtaining a sufficient number of facts to thoroughly test the theroy. Many operators will not allow examinations of well logs, and only through the comparison of a number of records can the underground conditions be determined. This secrecy is the more to be regretted as it really acts against the interests of the operator; the better the underground conditions are understood the better the operations can be conducted. A majority of the logs are kept in a manner which prevents a detailed study of the underground conditions and it is rare that samples of the various strata are preserved. These are necessary in order to compare the different strata in the various wells. It is important to test the gravity of the oil, not only at the moment that it is reached in the different oil sands, but also during the period when the well is beginning to flow, until such a time as it has come down to the stage of regular production. This would permit the determination of whether the introduction of the bore in the oil-bearing strata, in case of heavy gas pressures, has affected the internal structure of the strata in such a manner as to allow oil of different gravity, which may be accumulated in the close vicinity, to percolate. In other words, the study of the oil produced, and of the sand it brings to the surface, would give an opportunity to judge the underground changes.

Keeping in mind these restrictions, a short history of the development at the north end of the territory here under consideration may be interesting. This portion of the field covers section 36, T. 31-22, the western part of section 31, T. 31-23, and the extreme northern part of section 6, T. 32-23 (see accompanying sketch). The wells of the American Oilfields Co. along the east line of the S. W. ¼ are situated close to the axis of the Midway anticline. The contact of the McKittrick formation with the underlying shale (Santa Margarita) lies nearly one and a half miles southwest. Considering the steep dip of these shales at that point, this contact would be much deeper below the surface than it is actually found in those wells, so that it is clear that a large portion of the McKittrick has been eroded along this anticline. The steep northern dip of the oil horizon, 800 ft. within one half mile, finds its counterpart in a northeast-southwest strike having a 50° dip to the northwest, found on the west slope of the anticline in the northwest corner of section 1, T. 32-22, indicating a cross-fracturing of the strata.

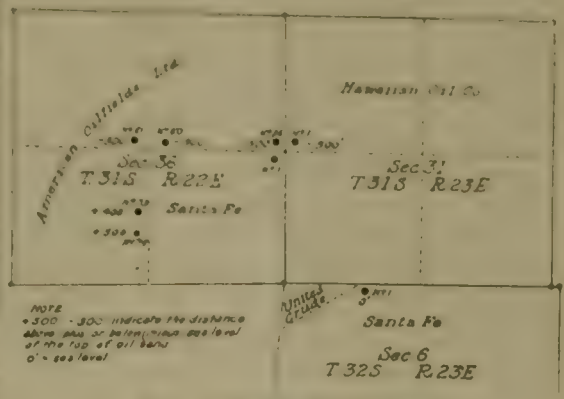


Fig. 2 Position of Wells Discussed.

Along the east line of the S. W. ¼ of section 36 the American Oilfields Co. has several wells. The southern wells have a depth of about 900 ft., increasing toward the centre of the section to 1700. These wells flowed when brought in, giving a good production, the gas pressure causing little or no trouble. The same was true of the wells of the same company along the south line of the N. E. ¼ of same section. The depth of these wells varies from 1700 ft. at the centre of the section to 1800 on its east line. The following official statement of the behavior of well No. 79[9] is instructive: "The well was brought in during May 1910, at 1000 bbl. per day, increasing gradually to 3000 on July 25. From July 26 to August 4, except one day when the well sanded, the flow ranged from 8000 to 10,000 bbl. On August 5 in the morning it flowed at the rate of 20,000 bbl., averaging 15,000 bbl. for the day. August 6, 7, and 8, the average was 16,000 bbl., reaching a maximum of 20,000 bbl. on the morning of August 8. According to advices from the well on August 13 it gave signs of sanding." To this may be added that on the same day No. 79 broke loose, well No. 1 of the Santa Fe in the northeast corner of the S. E. ¼ of same section also broke loose under heavy gas pressure. The elevation of the oil sand in No. 79 is +500, in well No. 56, close to Santa Fe No. 1, it is —500; these last two wells are about one-half mile northeast of No. 79. So far as reported in well No 56, the gas pressure although high, has not reached such a point that the well has got beyond control. The behavior of these wells would in my opinion suggest that when the wells of the American Oilfields Co. reached the oil sands, the gas pressure therein was relatively low, although strong enough to cause the wells to flow; that the movement of the oil toward the outlet, the company having at the time eight producing wells, created channels allowing gas pressure from surrounding territory to reach the producing territory, thereby

[9] *Mining and Scientific Press*, August 20, 1910, p. 248.

increasing their flow; that the Santa Fe well reached a point where the gas was under heavy pressure, possibly occurring in the liquid state, and that the disturbance caused by the sudden gasification of this liquefied gas was sufficient to allow it to reach well No. 79. It may be added that American Oilfields Co. No. 73, not very far from No. 79, gave at the time indications of sudden increase of gas pressure.

Hawaiian or Crandall No. 1 in the southwest corner of the N. W. $\frac{1}{4}$ of section 31, T. 31-23, was brought in, May 1909; the top of the oil sand is at —500 ft., 1796 ft. below the surface. This well passed several water-sands which gave much trouble; it never showed excessive gas pressure, and the well is now being pumped. It is 600 to 1000 ft. from No. 56 and the Santa Fe well in section 36, and apparently was not influenced by the gas pressure in those wells, consequently it may be assumed that the oil-bearing pools between these wells are separated by an impervious mass.

In the northwest part of section 6, T. 32-23, the Santa Fe brought in a big gusher in November 1909, the elevation of the oil sand being about at sea-level. This well is now being pumped, and has not been influenced by the developments in section 36, T. 31-22; the same is the case with the wells of the United Crude in the extreme northwest corner of same section 6. It may therefore be assumed that there is also an impervious barrier between the oil pools from which these wells derive their oil and those in section 36. It must not be concluded, however, that these impervious masses indicate intervening barren areas, as it is possible that in those areas oil-bearing lenses may exist, at a higher or lower level, in the producing zone.

Arsenic and Antimony.—These constituents are volatilized to a large extent in pyrite or semi-pyrite smelting. They may be almost entirely eliminated in reconcentrating the matte.

Force Account Costs

For many years it has been considered that economical engineering work could be done by contract only. Recently there has been a disposition to do more work under direct supervision of the engineers in charge of any construction. Around the mines this is usually referred to as 'working on company account.' In civil engineering such work is spoken of as being done on 'force account.' The U. S. Reclamation Service, under F. H. Newell, director, and A. P. Davis, chief engineer, has had perhaps more experience with force account work than any other large organization. The following figures, taken from their books, make an excellent showing for this method of work.

COMPARATIVE TABLE OF COST

	Force account.	Estimated cost if lowest bid had been accepted.	Estimated saving in cost.
Upper Deer Flat embankment	$279,820.83	$396,522.19	$116,701.36
Belle Fourche tunnel	33,230.29	92,592.54	59,362.25
Belle Fourche siphon	59,310.32	100,022.54	40,712.22
Okanogan main canal	*89,180.49	107,064.12	17,883.63
Keno canal (exc.)	58,354.59	74,610.32	16,255.73
Klamath, Clear Lake dam	88,524.32	97,248.52	8,724.20
Klamath, Clear Lake dike	10,882.16	23,845.10	12,962.94
Distrib. Sys., Dist. 5, T-C	32,132.02	35,925.38	3,793.36
Concrete Drop, Dist. 4, T-C	8,358.72	13,810.76	5,452.04
Uncompahgre project: Div. 18, south canal	7,321.74	11,851.00	4,529.26
Cold Springs dam	305,227.71	340,823.57	35,595.86
Shoshone Res. highway (canyon section)	12,779.26	27,214.50	14,435.24
Tieton tunnels (pav't.)	83,840.00	126,180.00	42,340.00
Tieton main canal	199,411.18	441,086.36	241,675.18

*Part of this work was done by small informal contracts after bid for entire work had been rejected.

STATEMENT FOR VARIOUS RECLAMATION PROJECTS SHOWING ACTUAL COST OF EXCAVATION AND LOWEST PRICES BID BY CONTRACTORS FOR THE WORK

Project.	Feature.	Class.	Quantity.	Unit *Actual Cost.	Unit Lowest Bid.
Klamath	Keno canal	Class 1	44,912	0.267	0.75
Klamath	Keno canal	Class 2	20,296	0.534	0.85
Klamath	Keno canal	Class 3	19,640	1.603	1.00
Klamath	Clear Lake dam	Dry 1	27,124	0.54	0.40
Klamath	Clear Lake dam	Class 3	29,852	1.83	2.20
Klamath	Clear Lake dam	Wet 1	2,905	1.41	1.00
Klamath	Clear Lake dam	Wet 3	1,600	3.99	5.00
Klamath	Clear Lake dike		14,660	0.43	0.60
Payette-Boise	Upper embankment	Earth and gravel	959,516	0.24	0.36
Belle Fourche	Tunnel south canal		5,641	1.84	7.00
Belle Fourche	Siphon south canal	Dry	15,445	0.403	1.25
Belle Fourche	Siphon south canal	Wet	2,960	1.50	3.00
Okanogan	Main canal	Class 1	70,797	0.26	0.46
Okanogan	Main canal	Class 2	10,261	0.60	0.60
Okanogan	Main canal	Class 3	16,192	1.32	1.45
Truckee-Carson	Distributing system, District 5	Class 1	223,139	0.144	0.15
Umatilla	Cold Springs dam embankment	Earth	590,000	0.32	0.29
		Gravel	126,568	0.30	0.35
		Rock Fill	32,494	1.18	1.50
		Class 1	34,342	0.24	0.40
		Class 2	5,574	1.13	0.55
		Class 3	3,938	2.37	1.25
St. Mary	Main canal, Div. 1, 2, and 3	Class 1	56,600	0.305	0.22¾

*Actual cost includes general expenses, etc.; bid does not.

Dry-Placer Machines

By Grove M. Perkins

In Arizona, Lower California and northern Mexico there are large areas of gravel that have been worked for nearly a hundred years in a crude way with many dry washers and several million dollars are said to have been recovered by this method. The miners could work only the rich ground and had to have favorable conditions in order to save the gold. One of the principal reasons for so many failures heretofore is, that in nearly all of these dry placers the gravel is cemented with carbonate of lime and in some places to such an extent as to form large beds of cement or conglomerate.

A little over a year ago, Mitt Quinner built at Nogales, Arizona a machine to pulverize gravel, which embodies some new features as an ore crusher and pulverizer. It has been working ever since at Bolnda, in the Altar district of Sonora, Mexico. It consists of a drum 40 in. diam. by 6 ft. long, which revolves on trunnions at 20 r.p.m. with a shaft 4 in. diam. in the centre, which revolves at 400 to 800 r.p.m., in the same direction as the drum. On this shaft there are clamped 36 chains, on the ends of which are fastened 8-lb. hammers; these are square, but are set so as to present an angle to the material, and are made of cast manganese steel. These hammers, though rigid when in motion, are still flexible, and at 400 revolutions per minute have a striking force of 1800 lb. The drum is made of two boiler heads, to which are bolted steel flanges that run on the trunnions. On the outer rim of the boiler heads, to form the sides of the drum, are bolted flat steel bars 1½ by 2 in. by 6 ft. long, which are spaced according to the desired fineness of the material to be ground—usually ⅝ in. apart. At the head of this drum or trommel, there is a 24-in. circular opening through which the mill is fed. At the discharge end there is a 28-in. round opening, which is protected with an adjustable shield so as to regulate the discharge of the oversize. The mill weighs 3 tons, occupies a floor space of 5½ by 15 ft., and requires 20 hp. to operate. In placer work it is adjusted to crush the softer cemented material to 8-mesh. About 50% of the material fed to the mill passes through the space of the bars, the remainder being discharged automatically as oversize. All the gold passes out with the fine screenings, except large nuggets, which are retained in the drum.

About sixteen years ago, Albert H. Stebbins began his experiments in the endeavor to find some means of separating the fine as well as the coarse gold from gravel and other materials, by a dry process at a low operating cost. He made experiments in different dry-placer fields. During this time he built and tried many machines and processes and finally perfected a table with a perforated metallic surface admitting a current of air over the entire table, at a low angle to it, thereby forming a thin film or cushion of air into which all the fine as well as the coarse gold dropped, to be collected in the riffles; the lighter materials passing along over the continuous air space. With the use of this perforated surface he has been able to construct a dry concentrating table that will make a high extraction and will save fine gold. The table has a reciprocating and progressive movement with a throw of ¼ in. and 300 vibrations per minute.

Since perfecting this dry concentrator Mr Stebbins has spent nearly three years in trying it under varying conditions, and has found that the metallic surface never gets out of order, never clogs up, and can always be depended upon to work well. This table is built in sizes that have an actual working capacity of from 5 to 40 cu. yd. per hour. It requires 2 hp. to operate a 5-cu. yd. table, with one additional horse-power to each additional 5 cu. yd. per hour in capacity. When the gold is liberated and freed in the gravel by the pulverizer, these dry tables will make as high an extraction as with Hungarian riffles, and will save as much flour gold as can be saved with cocoa matting. In mining the ground with a steam-shovel, the material is delivered in a large hopper, from which it goes to a coarse trommel (bars spaced about 5 in.) that rejects all large stones; the material passing through the grizzly goes to a hopper beneath which feeds the Quinner pulverizers, which crush, pulverize, and screen the material, discharging about 50% as screening containing all the gold. The balance, as oversize, is discharged from the rear end of the mill onto a belt-conveyor that leads to the stacker. The screening falls through a hopper on a belt-conveyor that discharges into the hopper bins, which feed directly on the dry-placer tables. The tailing from these dry concentrators discharges on a belt-conveyor that carries it to the main stacker.

Mattes and Concentration Ratios.—It is not often desirable to use a matte of less than 5% copper, for efficient collection of values. In cases where copper is lacking to bring the matte up to this standard, it would be advisable to re-charge enough roasted matte to supply this, providing the additional saving paid for the cost of the operations. The copper in the matte should be proportional to the matte fall. With high concentration, 10% copper, with low concentration 2 to 3% copper is sufficient. The grade of the matte should also vary directly with the amount of gold and silver and impurities present. In general, it is not good practice to use high concentration ratios such as 18 to 22 tons of charge into 1 ton of matte, except where conditions demand this or with exceptionally pure ores in furnaces of 200 or more tons capacity. A 10 into 1 or 12 into 1 concentration is about the most satisfactory limit. For example in a furnace 36 by 84 inches, making a slag assaying SiO_2 34%, FeO 33, CaO 20, concentration of 10 into 1 caused the furnace to crust badly and often necessitated refeeding of matte. A 15% matte fall proved more satisfactory.

A millsite can only be taken on unappropriated non-mineral land. It is not necessary to own a mine in connection with the millsite, as a custom mill or smelter may be built on such land.

Sixty Years of Rainfall in California

By Alexander G. McAdie

*The accompanying diagrams of seasonal rainfall first came into prominence during a period of drought, the dry seasons of 1897-8, and 1898-9, when there was widespread uneasiness among the people and a general misapprehension that the climate was permanently changing. The charts conclusively show that such dry periods are only incidental and give no true indication of a permanent change. Indeed, it was made plain that there was every reason for expecting a return to normal conditions.

It is not yet possible to forecast with any degree of certainty the coming season; but the careful student can detect in these records certain seasonal trends. He can also more intelligently refute the hasty conclusions put forth now and again by eager but poorly informed persons who think they have found the secret of seasonal forecasting.

It is plain that there is no regular sequence of wet and dry seasons, and this is as it should be, because while law is supreme in meteorology as elsewhere, and the storms develop, move, and disappear in accordance with physical laws understood in part, there are too many independent variables entering into the problem of rain formation and the condensation of the water vapor of the air to allow much hope for a regular and easy solution of the problem. It is plain from the charts that an abnormal wet month is not necessarily followed by another of the same character; or in other words, rainy periods are of unequal length. No one can predict from the existence of one dry month in winter that the balance of the season will be dry. All that can be said at present is that wet seasons and dry seasons come and go in a very irregular way. Nor is there any determinable period between abnormal conditions. The chart herewith covers the rainfall for sixty years at two stations, San Francisco and San Diego, more than 500 miles apart. If the sixty years be divided into decades, the following averages appear.

SAN FRANCISCO

	Inches.
10 seasons, 1849-59	227.47
10 seasons, 1859-69	257.85
10 seasons, 1869-79	227.00
10 seasons, 1879-89	234.23
10 seasons, 1889-99	218.81
10 seasons, 1899-09	210.28

*Abstracted from *The Pacific Rural Press.*

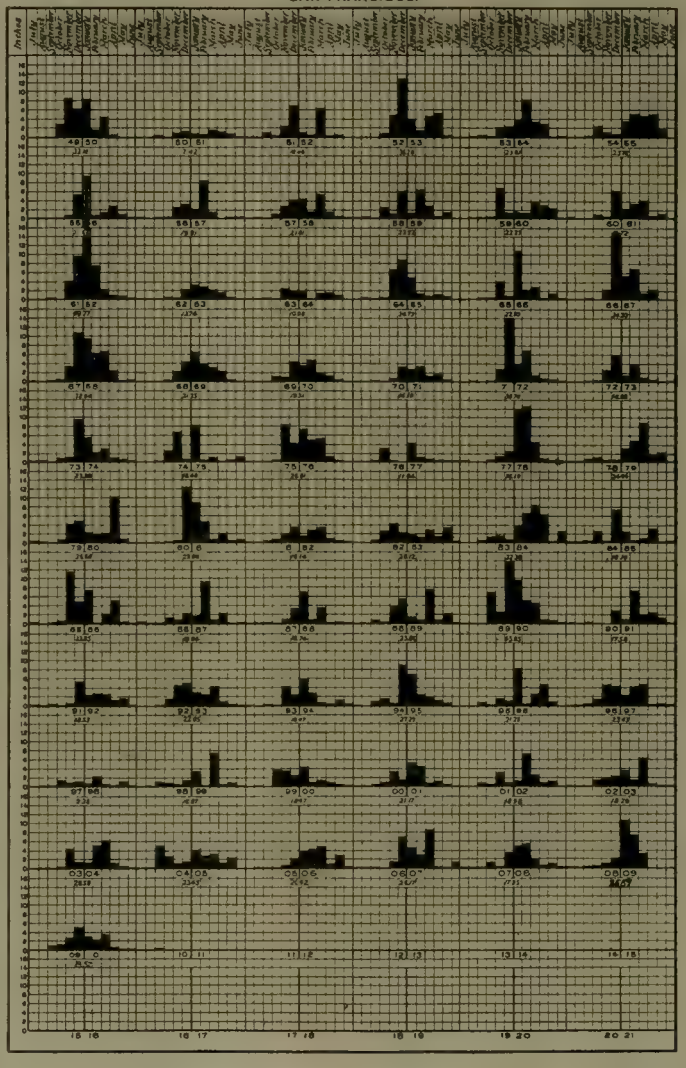
The mean rainfall for six decades is 229 inches.

It is interesting to note that during the month of January 1862, 24.36 inches fell: more rain fell in one month than the normal annual rainfall.

SAN DIEGO

	Inches.
9½ seasons, 1850-59	81.05
10 seasons, 1859-69	97.04
10 seasons, 1869-79	84.71
10 seasons, 1879-89	119.21
10 seasons, 1889-99	88.54
10 seasons, 1899-09	97.24

SAN FRANCISCO.



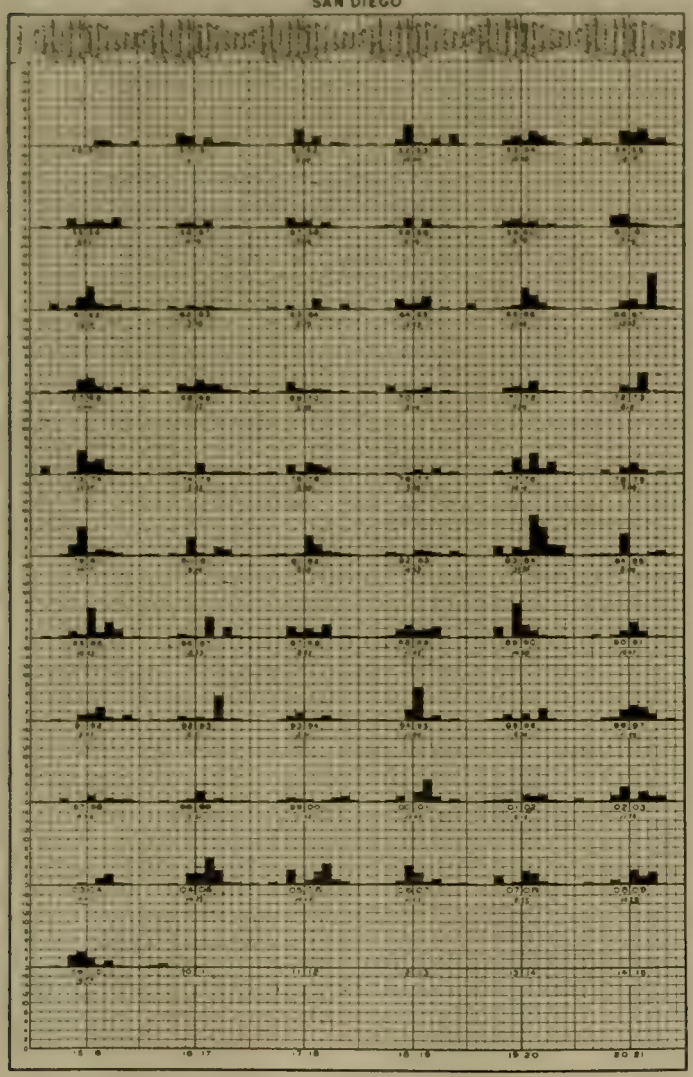
Rainfall Records at San Francisco.

Allowing for the missing half season, the average rainfall for each ten seasons becomes 95 inches. Note that in February, 1884, there was a rainfall of 9.05 inches; or almost as much as the normal rainfall of an entire season.

The statement will often be heard, especially in southern California, that a dry October presages a dry winter, but the records show that little dependence can be placed in statements of this character. One of the heaviest seasonal rainfalls, that of 1873-4, followed a dry October. A wet fall is, however, frequently followed by a wet winter.

Also be it remembered that the State of California

extends from latitude 32° 40' to 42° 0' N. It has a mean length of nearly 800 miles, with an average width of 200 miles and an estimated area of a hundred million acres. Naturally in so large an area there must be great diversity in the character of the rainfall. At some localities in the State the seasonal rainfall does not average one inch while at others it exceeds 80 inches. In general, seasons of heavy rainfall in the north are also seasons of good rainfall in the south. But exceptions can be found even



Rainfall Records at San Diego.

to this. There is one type of storm, the Sonora, which, causing heavy rains in the south, leaves the northern counties practically without rain. On the other hand, many of the northern storms pass eastward without resulting rains in the southern counties.

Pyritic ore is not used for fuel in Colorado or elsewhere, except in smelting sulphide ore by what is known as 'pyrite smelting,' in which little or no carbonaceous fuel is added to the furnace charge. In practice it is found better to add coke and depend less on the sulphur.

COAL RESOURCES OF TEXAS

William B. Phillips, director of the bureau of economic geology of the University of Texas, has issued an interesting statement of the coal resources of the State, in which he says:

Since the year 1884 the production of coal and lignite in Texas has been 18,199,584 tons. The separation of these two items in statistical reports was begun in 1895. Since that time the production of coal has been 10,767,866 tons, valued at $22,596,544, about $2.10 per ton at the mines. During the same period the production of lignite has been 5,488,218 tons, valued at $4,767,830, or an average of 82.8c. per ton at the mines. During these 15 years the production of coal has increased so that for each ton mined in 1895 there were 3.17 tons mined in 1909. In the year 1895 the average value of the coal mined was $2.22, and in 1909, $2.37. The production of lignite increased much more rapidly than that of coal. For each ton of lignite mined in 1895 there were mined 4.75 tons in 1909, the value per ton for the respective years being 90 and 82.8c. The latest estimates of the original supply of bituminous coal in Texas show that there were 8,000,000,000 tons, and of lignite 23,000,000,000 tons, or a total fuel supply of 31,000,000,000 tons. If each ton of fuel mined represents a loss of 1½ tons the loss of coal and lignite thus far is 27,299,376 tons, an insignificant proportion of the original supply. During the last 26 years the loss of fuel has been so small, compared with the original supply, as to be negligible in any estimates affecting the situation. The workable coal area may be taken as 8200 sq. mi., with an additional area of 5300 that may contain workable seams. There is much uncertainty in regard to the workable lignite area. The estimate of M. R. Campbell, of the United States Geological Survey, shows 2000 sq. mi., but it is probably much nearer 20,000. For the additional lignite area he gives 53,000 sq. mi., or a total of 55,000. The total workable area of coal and lignite has been taken as 10,200 sq. mi., with an additional area of 58,300 that may prove to be workable.

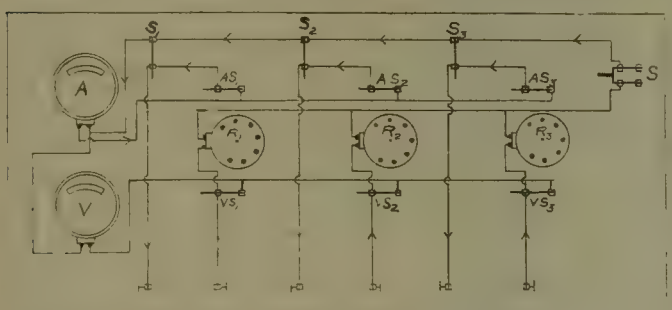
Leading copper selling interests state that there is still considerable copper to be bought by domestic consumers for the last two months of the current year, notwithstanding the record-breaking sales of the past few weeks. The statement that foreign purchases have been largely responsible for the large recent transactions still holds, with the American manufacturers at the 'tail end of the cart' picking up odd lots for the most part.

Electrolytic Determination of Lead in Ores

By R. C. Benner and W. H. Ross

The determination of lead in ores by the electrolytic method has been much used during the past few years in many parts of the West. In this determination the lead is deposited as the peroxide on the anode and has to be weighed as such. This compound of lead, when deposited electrolytically under the ordinary conditions used by chemists, varies slightly in composition, so that a different factor, which has in but one case been the one called for by theory, gives the correct result when used.

[When the peroxide has been deposited on a dish



it is possible to ignite and weigh as the monoxide with excellent results,[1] but with the gauze electrode, which has been used in this piece of work, it is impossible to make the ignition over the bunsen flame in a satisfactory manner. Sand[2] has been able to deposit the peroxide in such a condition that the error caused by the use of the theoretical factor is negligible. This was accomplished by depositing the peroxide from a solution free from the oxides of nitrogen and ammonium nitrate, at a temperature of from 94 to 97° C., using a current of five amperes. When the deposition was performed under these conditions he used the factor 0.8651 after drying the deposit with alcohol and ether.

When making use of the gauze electrode designed by one of us[3] for the rapid precipitation of lead, it is necessary, as well as convenient, to have a switchboard system which will enable one to connect the electrodes and take ammeter and voltmeter readings quickly and conveniently. The apparatus shown in the accompanying illustration has been used by us for this purpose and has proved satisfactory. Each electrolytic cell is independent and the number which may be connected up in the series is limited only by the current available. Connections are shown in the illustration for three cells.

The three cells are joined in parallel, and one or more may be operated at the same time by means of the single-pole single-throw switches S_1 to S_3. Unless an ammeter or voltmeter reading is desired the switches AS_1 to AS_3 and VS_1 to VS_3, which connect with the ammeter and voltmeter respectively, are left open. The current flowing through Cell C_1, for example, will pass from switch S in the direction indicated by the arrows, through switch S_1, which is closed, to cell C_1, then through resistance R_1, and finally to the switch S. When it is desired to know the current flowing through any particular cell as C_1, the switch AS_1 is closed and S_1 opened. The current will then flow through the ammeter A, to the switch AS, and through C_1 and R_1 as before. In the same way the current flowing through any other cell is found by closing and opening the corresponding switches with which it is connected. The voltmeter is so arranged that it may be joined in as a shunt on any of the parallel circuits through which the current passes in going through the different cells. Thus, if the voltage of cell C_1 is desired, switch VS_1 current passing through cell C_1 will pass by way of switch S_1, but a small fraction is closed, the other two voltmeter switches being left open. The greater part of the of the current will separate at S, and pass through the voltmeter in the direction indicated by the arrows. In the same way the voltage of any of the other cells may be found by closing its voltmeter switch for an instant. When taking a voltmeter reading of any cell as C_1 it is immaterial whether switch S_1, AS_1, or both are closed. Each of the cells C_1 to C_3 has a resistance R_1 to R_3 joined in with it, so that the current flowing through any particular cell may be regulated at will. Each resistance should have such a range as would be sufficient to vary the current within the limits desired. The system as thus described should be set up in switchboard form. The connecting wires may then be placed at the back of the board, making a simple and compact piece of apparatus. The terminals represented in the sketch should be made of aluminum so as to avoid contamination of the electrolyte with copper as is likely to be the case when the ordinary form of terminal is used.

A lead nitrate solution containing 0.2508 gram of lead in 10 c.c. was prepared, in order that experiments might be made with the gauze electrode, and the accuracy of this method proved when stationary electrodes were used. The following determinations were made in 75 c.c. of solution, in the presence of 10 c.c. of nitric acid (sp. gr. 1.40) with a current of 4.8 amperes and 2.5 volts. The electrolyte was warmed during the deposition, so that the temperature of the cell was kept just below the boiling point; the highest temperature at which it is possible to carry on the electrolysis without liberation of the oxides of nitrogen, which, according to Sand, tends to make the deposit non-adherent.

PbO_2 found.	Equivalent to Pb. Factor 0.866.	Pb taken.	Time.
0.2889	0.2502	0.2508	13
0.2905	0.2516	0.2508	20
0.2903	0.2513	0.2508	20
0.5814	0.5035	0.5017	20
0.5797	0.5020	0.5017	25
0.8734	0.7564	0.7525	25
0.8715	0.7547	0.7525	25

[1] Treadwell, 'Analytical Chemistry,' New York, 1904, Vol. II, p. 140.

[2] *Chemical News*, 100, 269.

[3] Benner, R. C., *Jour. Ind & Eng. Chemistry.*

The results given above verify those obtained by Sand and give an idea of the accuracy of the method. The rate of precipitation was determined with a current of 3.5 volts and 4.2 amperes at a temperature between 94 and 97° C. The solution in each case contained 0.2015 gram of lead and 10 c.c. of concentrated nitric acid and had a volume of 75 cubic centimetres.

RATE OF PRECIPITATION

Time, min.	Lead taken	Lead deposited Factor 0.866	Peroxide deposited
1	0.5008	0.2412	0.2789
2	0.5008	0.4126	0.4766
3	0.5008	0.4526	0.5233
4½	0.5008	0.4874	0.5633
7	0.5008	0.5012	0.5787
11	0.5009	0.5007	0.5782

These results show that it is possible to deposit all of the lead in a 0.5 gram sample of ore in from 5 to 10 minutes. In this case, as with copper, by far the greater part of the lead was deposited in the first 3 minutes, while the remaining 10% took 3 minutes longer.

A short process is possible for some classes of ores, because all of the sulphur from galena as well as from some other sulphides can be removed in form of hydrogen sulphide, by warming with hydrochloric acid (2 to 1). This makes it possible to use the following process for ores which contain no interfering sulphides. From 0.5 to 1.0 gram of the finely powdered ore is weighed out, warmed with 15 to 20 c.c. of hydrochloric acid (2 to 1) until completely disintegrated and all of the sulphur evolved as hydrogen sulphide, but not concentrated so far that the lead chloride crystallizes out (this causes violent bumping). Then 20 c.c. of concentrated nitric acid is added and boiling continued until all of the hydrochloric acid is expelled and the nitric acid has a volume of 10 c.c. It is then diluted to 75 c.c. and electrolyzed in the usual manner. The ores containing sulphides which render the use of the preceding method impossible, may be disintegrated with nitric and hydrochloric acids, 15 c.c. of sulphuric acid being then added and the solution evaporated until white fumes of sulphuric anhydride are evolved. After cooling, 50 c.c. of water is added; the solution boiled until all of the basic sulphate of iron is dissolved, then diluted to 200 c.c., filtered, and washed free from sulphuric acid. As much as possible of the lead sulphate should be left in the beaker and washed by decantation. The lead sulphate is washed from the filter into the beaker containing the bulk of the sulphate with the smallest possible amount of water. Then 10 c.c. of a warm saturated solution of ammonium carbonate is poured through the filter, received in the beaker containing the lead sulphate and warmed until all of the sulphate is converted to the carbonate. The lead carbonate is then filtered through the same filter, washed with water until nearly free from ammonium carbonate, dissolved in 40 c.c. of nitric acid (1 to 3), the filter paper washed free from lead, and the solution electrolyzed in the usual way. The following results on a lead ore containing copper will show the accuracy of the method. Analysis of the ore by ordinary methods showed that ore No. 1 contained 2.70% copper, 21.40 lead; ore No. 2, 2.28 copper, 22.20 lead. By the electrolytic method ore No. 1 was found to contain 21.67, 21.61, 21.67%, and ore No. 2, 22.06, 22.20.

Where it is desired to do away with the factor and at the same time use the electrolytic determination it is possible to do so by heating the gauze electrode on which the peroxide has been deposited in a muffle or small electric oven at a temperature of about 500° C. The following results show the accuracy of this modification of the electrolytic method.

Lead taken	Lead found Factor 0.866
0.2509	0.2511
0.2509	0.2506
0.5018	0.5025
0.5018	0.5026
0.7527	0.7518

COPPER-MINING INDUSTRY OF RUSSIA

By John H. Gray

*During various periods in history the territories now forming the Russian empire have been alternately exporting and importing copper and copper ware, but during the nineteenth century Russia became an ever-increasing market for copper of foreign production.

About the beginning of the present century, when there was everywhere a great demand for copper and it became the object of acute speculation, attention was directed to entire groups of Russian mines inadequately worked or fully abandoned, and, with the aid of cheap foreign capital and foreign engineers, the mines were energetically taken in hand. As a result, the table which follows shows how Russia is now fast becoming a self-supporting country in the matter of copper, and that the date cannot be far off when it will have to look for outlets in the world's markets for its surplus production of copper. From far away districts in Asia, especially where there are no properly arranged and convenient trade routes, the cost of transportation, from 25 to 51½c. per pood (36.2 lb.), will greatly impede this, but copper from Caucasia, about one-third of the total production, may well be devoted free for the world's markets. It must be kept in mind, however, that the growing population of Russia, with its demands, will remain an increasing consumer of the country's copper. From estimates recently made, Russia will consume 24,768, 27,054, and 29,538 tons in 1910, 1911, and 1912, but still the output is expected to grow more rapidly than that, as may be judged by the following table.

Year	Production, tons.	Importation, tons.	Consumption, tons.
1901	9,306	12,348	21,654
1902	10,404	19,584	29,988
1903	10,152	16,182	26,334
1904	10,800	21,078	33,878
1905	10,800	21,078	31,878
1906	11,340	14,760	26,100
1907	16,218	4,896	21,114
1908	18,558	4,860	23,418
1909	20,106	3,834	23,940

*Daily Consular and Trade Reports.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

An Explanation Wanted

The Editor:

Sir—I write the following description of cyaniding a small lot of tailing at the McCabe mine, Riverside county, California, in hope that some one may be able to throw light on the subject. It would be of benefit to those interested in cyaniding situated as I have been in an out-of-the-way place and operating in a small way. While I am familiar with the ordinary cyanide process, having been employed from time to time as a solution-man, I am not a chemist or cyanide expert. I hope that the following account of the successful treatment of this material, after I had made a failure of straight leaching, may be of sufficient interest to some chemist to cause him to give a clear explanation of the process. I would like also to learn to whom credit is due for introducing the method in practice.

The tailing was crushed by stamps until it would all pass a 24-mesh screen. About one-third of the total tonnage was slime, which was run to a separate pond. After cultivating and rolling the slime to pulverize it, I mixed one ton of slime with two of sand while filling the vats by hand shoveling, using scrapers to bring the material to the shovelers. I had no trouble with percolation at any time. The leaching was done in tanks 4 ft. deep and 12 in diameter. My early runs, which proved failures, were under ordinary conditions, using strong and weak solutions alternately and precipitating on zinc shaving. In these runs I used cyanide solutions of 0.15 to 0.40% strong, equivalent to 3 to 8 lb. of cyanide per ton of water, and used on average 3 lb. of lime per ton of tailing to neutralize the acidity. The extraction made by the different solutions in any run was never better than 35% of the assay-value of the heads. After repeated and disheartening failures, I gave up the treatment. I then submitted samples to a chemist for analysis with the following results as far as metallic contents were concerned: arsenical sulphide, 3%; zinc-blende, 1.5%; lead, less than 1%; antimony and silver, traces; gold, 0.32 oz. per ton. I submitted this to an expert who teaches cyaniding and was advised to quit, pocket my loss, and look pleasant. About a year later I met a fellow solution-man in Los Angeles who at one time had been employed in the northern part of the State, where he assured me ore similar in character was being successfully treated. He was unable to give me the address, or the men in charge were unwilling to bother with answering my frantic requests for help; at any rate, I received no information except that gleaned from my chance acquaintance, which was very little. It was about as follows: To the solutions used, potassium acetate was added in the proportion of 1 lb. acetate to 5 lb. potassium cyanide. The same proportions were used when bringing a solution up to standard. Lead oxide and shavings were used in the first compartment of the precipitating box. He assured me that in some manner the acetate in the solution, combined with the lead, caused a perfect precipitation of gold from complex or fouled solutions. After studying the matter for several weeks I decided to try again. My tests gave satisfactory results and solved what was to me a very difficult problem.

I made up my solutions and dressed my zinc-boxes as directed, and proceeded with my first run, using a single standard solution of 5 lb. KCy with 1 lb. acetate for the first or saturating solution. This was followed with a 2-lb. solution, the weak and strong solutions following alternately for 96 hours, when the vat was drained and wash-water introduced until the bulk of solution was again normal, when the charge was practically dry. Holes were bored with a tryer over the surface of the charge and the resultant sample dried and assayed with the, to me, astonishing result of 94% extraction. I then made assays on the sump solutions which proved to contain less than 20 cents per ton in gold. As the original tailing being treated averaged more than $6 per ton, this recovery was satisfactory. During the succeeding runs, I had no trouble either in leaching or precipitating. Since, however, everything connected with the operation is strange and past understanding to me I will go a little further into detail in regard to precipitation. I made repeated assays on the gold-bearing solutions in the zinc-boxes and found that little gold passed below the fourth compartment, and the most peculiar thing was the action or condition of the zinc shavings in the upper baskets. The sponge remained porous as ever, but after a few days' run became soft and velvety and at a touch would go to slime, the zinc having lost its spring or wire-like character. Still the precipitation seemed to be perfect, and on the final clean-up the total recovery of bullion was more than 90% of the assay-value of the material in the tanks as filled. The bullion melts assayed above $15 per ounce. I can not attempt to explain anything other than that described above, but have learned that several plants in California and Nevada use this method as a whole or in part, and would be pleased to have some of the chemists in charge make some of the dark places light, and tell why I successfully treated this sand, or give a description of plants that use the process.

I. A. JACKSON, Jr.

Los Angeles, October 31.

Inhalation of Mineral Dust

The Editor:

Sir—Replying to 'Drill Runner's' query regarding 'Inhalation of Mineral Dust,' which appeared in your issue of October 15, the following explanation will probably cover the majority of cases. Underground, the dust from machine drills is to a considerable extent composed of sharp chips or cuttings of quartz and other silicified rocks. In the majority of cases the cuttings fall from 'uppers' and the sharp par-

ticles of rock drop away from the drill bit without being further pulverized. In the few cases where the rock is soft and free from quartz stringers the dust is much more finely divided, and moreover seldom has any serious effect on the drill runners. In the dry crushing mill on the other hand the prevalent dust is produced from the soft 'talcy' portion of the ore, which is reduced to an impalpable powder during the process of reducing the harder and more siliceous portion of the ore. This latter material is finally reduced to a granular product approaching sand of varying degrees of fineness. Even after continued grinding or stamping these particles will settle almost immediately in air and will therefore not produce the impalpable powder which forms the bulk of dust noticed in a dry crushing mill.

E. A. C.

Tonopah, Nevada, October 28.

Hardening and Tempering Drill Steel

The Editor:

Sir—Having had difficulties similar to Mr. MacDonald's, I read with interest his letter regarding the hardening and tempering of drill steel in your issue of October 22. After having observed the methods of many tool sharpeners, good, bad, and indifferent, in various parts of the country, I have come to the conclusion that good mine blacksmiths are hard to find, but that when one is found he can always, after a trial or two, make good drills. The method noted below differs from that given by Mr. MacDonald and may be of interest.

Hammer checks are usually caused by forging too cold; ordinary steel should not be worked below a medium red heat, although it does no harm to finish the cutting edge with light blows at a dull red. In shaping the bit, hammer toward the shank as much as possible; that is, do not draw it out any more than is absolutely necessary. After sharpening it is very important to allow the drills to cool. This permits any molecular strains caused by the forging to adjust themselves; if the steel is hardened without being thus annealed it is extremely likely to crack. When reheating for the purpose of hardening, the steel should never be heated enough for scales to form on the surface. If a piece does accidentally get so hot that scales form, it should be allowed to cool thoroughly and be heated again. When plunging, if the surface of the water is kept at the same point on the steel all the time the point or edge of the tool is under water, a crack is apt to develop at that point. For this reason it is best to plunge the tool deep into the water and so prevent the formation of a sharp surface between the soft shank and the hard edge. The slower the heat runs down when the temper is being drawn, the better. The tempering water should not be allowed to become hot. There is considerable difference of opinion among blacksmiths as to the effects of the water used in different localities on the tempering of drills. Some advocate the use of salt, sal ammoniac, or other 'dopes' in the tempering water; some say that different waters require different heats; others say that the water makes no difference whatever. My own observations lead me to believe that it makes little if any difference where, as is generally the case, the water is reasonably pure.

Horace F. L.

Colorado Springs, Colorado, October 28.

Tin Smelting

The Editor:

Sir—Can you or some of your readers tell me the composition of the block tin that reaches the refining works at Swansea? I understand that the concentrate is smelted in Cornwall and the product shipped to Swansea for further refinement. What is now done with this product at the Swansea tin-plate works? Why are the works situated at Swansea instead of some convenient place in Cornwall where the tin is largely produced? Are there any tin-plate works in America similar to the one at Swansea?

George H. Carter.

Rawhide, Nevada, October 26.

[In tin smelting, as in treatment of lead and copper ores, proximity to the mine is not always the first consideration. In order to operate economically, mixtures of ore are necessary. In Cornwall the concentrate produced locally is mixed with richer Bolivian ore to which is added culm, slaked lime, fluorspar, and occasionally slag or other products of previous operations. The work carried on locally is the production of block tin. This can be accomplished in small and cheaply constructed furnaces just as copper matte can be produced in a relatively cheap plant. The block tin, like the matte, must be refined, and refineries are generally established at points determined by favorable transportation facilities and nearness to markets rather than in the vicinity of mines. For much the same reason that base bullion and blister copper in the United States are generally sent East to be treated, block tin goes to Swansea and other points for refining. In both cases there are advantages on the side of established works operated by experienced men. The United States produces but little tin ore and the smelters operating here are de-tinning establishments engaged in re-melting scrap. Small reverberatories for treatment of ore have been operated in California and in other States, but so far as we know all are now closed. We do not have at hand analyses of the block tin before refining. The impurities, however, include iron, copper, lead, antimony, and arsenic, which alloy with tin at the high temperature necessary in reduction of tin oxide.—Editor.]

Reinforced concrete is considered superior to almost every other material for building with a view to resisting earthquake shock. The only building that did not sustain severe loss at Stanford University at Palo Alto, California, from the earthquake of April 18, 1906, was a structure of concrete—the museum. It was built nearly 20 years ago, when the art of constructing reinforced concrete buildings was not as well understood as at present.

Special Correspondence

WASHINGTON, D. C.

Conference of Mining Engineers.—West Virginia Decreases Accidents. —Projected Alaska Legislation. — Coal Lands Restored to Entry. —Land Office and Forest Service.

The conference of the mining engineers connected with the Bureau of Mines closed with a dinner at the Fort Pitt hotel, October 29, and the men scattered to take up their regular work with the new mine-rescue cars. Car No. 1, in charge of Charles Enzian, left for Monongahela City, Pa., where the first demonstration of rescue apparatus and lecture were given. This car will visit Marianna, Brownsville, Uniontown, Connellsville, Scottdale, Indiana, Johnstown, Windber, South Fork, Portage, Cresson, Punxsutawney, Clearfield, Philipsburg, and State College in the bituminous fields of Pennsylvania. Car No. 2, in charge of R. Y. Williams, left for work in Indiana, Illinois, and Kentucky. No. 3, J. C. Roberts in charge, will travel in Colorado and New Mexico. No. 4, with Mr. Wolflin as engineer, will cover the northern territory from Montana west. No. 5, J. J. Rutledge in charge, is already at work in the coalfields of West Virginia, Kentucky, and Tennessee. No. 6, in charge of Sumner S. Smith, will soon be sent to Wyoming and Utah. A seventh car will be held in reserve at the Pittsburg station to answer calls in western Pennsylvania and Ohio. Among accidents recently investigated by the engineers was one in which an explosion occurred when no one was in the mine. Evidently the 'careless miner' was not to blame in this case, unless he neglected to extinguish a burning blower.

That the work of the Technologic Branch of the Geological Survey, now the Bureau of Mines, is beginning to bear fruit was evidenced recently in a statement issued by Mr. Laing, Chief Mine Inspector West Virginia. He said that in the last seventeen months, not a single man had lost his life in the coal mines of West Virginia through the explosion of gas or coal dust. In the year before, more than 100 were killed in such explosions. J. A. Holmes, director of the new work, early warned against the use of any but the short-flame permissible explosives in dangerous mines. This was made a rule in West Virginia and none but 'permissible explosives' bearing the stamp of approval of the Government may be used in those mines. Warnings against the dangers of coal dust were also issued, and the mine owners of West Virginia, at the suggestion of Mr. Laing, took precautions against the accumulation of coal dust, evidently to some purpose.

It is expected that there will be important legislation this winter affecting Alaska. George W. Wickersham, attorney general, and Charles Nagel, Secretary of the Department of Commerce and Labor, spent the summer in Alaska at the instigation of Mr. Taft. They went carefully over the field and held conferences with every man of any prominence. Their report on what is necessary to aid in the development of the mineral resources of Alaska is now in the hands of the President. He will undoubtedly outline his views on this important problem in his annual message to Congress when it convenes in December. Messrs. Wickersham and Nagel refuse to discuss the results of their trip to the North, with the exception of remarking that something should be done by Congress at once to open up Alaska. Several weeks ago the Interior Department promulgated an order throwing open to agricultural entry 900,000 acres of land withdrawn as being valuable as coal lands. The opening of these lands was accomplished under a recent act, one of the administration conservation measures, providing for the agricultural entry of the surface of public coal lands, the coal deposits being reserved for separate disposition. The West should be exceedingly benefited by the measure, according to the officials of the Department of the Interior, permitting, as it does, a twofold exploitation—the use of the surface for crop raising and the separate use of the coal. The act does not apply to Alaska.

Charles Mindeleff, of New York, an expert metallurgist, has been appointed by the Treasury Department to visit all the mints and report suggestions for economies and improvements in the processes of weighing, assaying, melting, and refining. To promote co-operation between the field officials of the General Land Office and the Forest Service in the settlement of claims for homestead settlement within the National Forests, representatives of the Interior and Agricultural departments have left Washington for the West to confer with the field agents of these two branches of the Government. The task has been delegated to James M. Sheridan, chief of the field division of the General Land Office; D. D. Bronson, of the Forest Service, and R. W. Williams Jr., assistant to the solicitor of the Department of Agriculture. The purpose is to make settlement of claims between the Government and the public easier for the latter.

LONDON

Interesting Magnetic-Concentration Process. — Remarkable Copper Mine in Chile.—The Caucasus Copper Company.

Interest has been revived this week in the Murex magnetic concentration process by the issue of official information as to the progress of operations of the company owning this process. *The Mining Magazine*, in October a year ago, published a statement relating to the claims of the inventor, A. A. Lockwood, and of the directors of the company. Briefly the process consists of adding magnetite or other magnetic mineral to sulphide ore together with sulphate of alumina and some oily substance and removing the agglomerated magnetite and sulphide by means of magnets. A plant was first erected at the Cordoba copper mine in Spain; this is doing well on all classes of ore and dump material, and an additional unit has been ordered. The plant erected at the Broken Hill, Block 14 mine, has not progressed so rapidly, partly owing to the illness of the engineer who was sent out, and partly because the old plant available for use was not easily adapted to the process. The latest cable shows that the engineer in charge sent 73 tons of Broken Hill ore, as it comes from the mine, through the machine in 30 hours, and that the tailing contained only ½% zinc, 2% lead, and 1.9 oz. silver. It is announced that Mr. Lockwood is to go to Broken Hill shortly. Arrangements were made with Alexander Hill & Stewart to erect a plant at the Van Roi mine, British Columbia; this arrangement was subsequently modified by building the plant at a smelter in that country so that mining engineers and metallurgists wishing to inspect the process might have easier access to it. A plant is being sent to a silver mine in Bolivia belonging to Aramayo & Co., and another to the Malines zinc-lead mine in France. It is also reported that a contract has been made to treat an ore consisting of blende and magnetite found at the Cristoff mine, Germany. These last three plants, as well as that at Cordoba, have been supplied on a royalty basis. The directors report that patents have been obtained in every country without difficulty, and that no opposition to them has so far appeared. The capital of the company is £120,000, of which £89,217 went for purchase of patent rights; about £25,000 has been spent on plant, experimental work, and administration; and about £7000 remains. The directors expect to be drawing an income from royalties before long. People often ask the meaning of the word 'Murex.' It is Latin for a 'shell,' and Mr. Samuel, one of Mr. Lockwood's financial supporters, belongs to the family of Samuels that controls the Shell Transport & Trading Co., which is now known in America as the powerful rival of the Standard Oil Co. in the East.

The Poderosa Mining Company, Ltd., was formed in November 1908 to acquire a group of copper mines in the Collahuasi district, Chile, at an altitude of 15,000 ft., belonging to a local company called the Compania Minera Poderosa de Collahuasi. The first manager was Robert Hawxhurst, Jr., of San Francisco, but he did not remain long owing to disagreement with the board. Several of the directors retired at the same time and the board was reconstituted. C. H. Macnutt is now manager, and W. J.

Barnett consulting engineer and also a director. The report of the company covering the year 1909 was not issued to the press or public and the meeting of shareholders was held privately so I have only recently received the report in question. The capital of the company is £60,000 in 1s ordinary shares of £1 each and there are £30,000 debentures. During the year there 25,382 tons of ore was sold to the smelters, mined through the part of Mejillones averaging 2.2% copper and 6½ oz. silver and the amount realized was £181,[illegible]. The cost of mining has been greater than was expected and amounted to £155,253 of which the transport by rail accounted to no less than £40,489. In addition, management at London and at the mine cost £16,945, mine development £7,457 and £6069 was allowed for depreciation. The net loss for the year was £40,814 to which has to be added £25,000 as an interim dividend paid in July by the former directors making the total adverse balance for the year £65,814. This distribution of dividend was due to an error of judgment on the part of the board, who only had a vague idea of what the cost of mining would be. The report now issued is a composite one. The work during the first half of 1909 is described by Mr. Hawxhurst and during the second half by Mr. Macnutt, while Mr. Barnett gives a general account of the mining operations. The shipments during the first half of the year were 12,999 tons averaging 2½% copper and 7 oz. silver, and during the second half 13,401 tons averaging 2% copper and 5½ oz. silver. In addition to this shipping ore, about an equal amount of ore was sorted out and placed on the dumps to await further treatment, the average content of this was 6% copper. The largest proportion of ore came from the Poderosa mine, about 20% came from the San Carlos, and a small amount from the Rosario. On December 31 the reserve at the Poderosa was 20,000 tons of developed ore averaging 2½%, and 7000 tons of probable ore. The dumps at the three mines contain 64,800 tons averaging 5.6% copper. I may add here that the monthly reports now published show an increasing output, the figures for September being 2392 tons assaying 2.2% copper. As regards smelting on the spot, Mr. Barnett reports adversely. In the first place there is an excess of silica and no suitable flux is found near-by; secondly the cost of carrying coke to the mine is high; and third, the ore reserves are not sufficiently great to warrant the capital expenditure. On other points he speaks hopefully of the prospects of the property.

The Caucasus Copper Co. was formed in 1900 to acquire the Dzansul copper mine in the Russian Caucasus. Several high-class mercantile firms in London hold the shares, and a large interest is in the hands of the J. P. Morgan group. The ore is plentiful, of low-grade, and difficult to concentrate. The first attempt at treatment was by direct smelting, but so large an amount of flux had to be added that the copper content of the furnace charge was unprofitably low. Subsequently dry magnetic concentration was tried without success. Two years ago James Colquhoun, the former manager of the Arizona Copper Co., joined the board and undertook the study of the concentration problem. The new plant is giving satisfaction, and is now treating 500 tons of ore per day. The monthly production of concentrate is now sufficient to yield 200 tons of copper in the smelter. The directors have decided to increase the capacity by another 250 tons and later to bring the total capacity to 1000 tons per day. During the year ended May 31, the production of copper was 1140 tons and the loss on operations was £27,590. In addition £48,840 was spent on new plant, and £99,320 was written off for depreciated plant. The roasting furnaces at present in use are not sufficient to treat the output, and two new furnaces are being erected. The supply of power is being increased by passing the gases from the reverberatories through water-tube boilers. The smelting department has been for seven years in the hands of W. R. Van Liew, who has recently been appointed general manager of the company. The amount of money spent in this venture has been great, as may be seen by an inspection of the balance-sheet. The capital is £500,000, there are £636,000 debentures, and £459,900 has been advanced on loan

ST. PETERSBURG, RUSSIA

Number of Dredges at Work — Improvement Over Preceding Years.

The annual report of the work done in the year 1909 by gold dredges in the Russian and Siberian goldfields has just appeared and from most points of view may be called a satisfactory statement. If for no other reason than that the Russian dredge superintendent has learned to do his work well, or he has learned where to take his dredge. It is difficult, if not impossible, to identify the various dredges. Some have been obtained from America, some from England, and some from the Dutch dredge-building yards, but a relatively large number have been built in Russia. The place where most of the Russian dredges are made is the Putiloff (Russia's premier engineering works). Another large concern that used to build many dredges is the Nevlansky Works, but, probably because dredge building was not sufficiently remunerative, it has discontinued the construction of new dredges and limits its operations to the repair of old ones. This is likewise a gold mining firm and it exploits certain alluvial deposits. But with the disappearance of the Nevlansky Works as a dredge maker, the Sormoff Engine Works has entered the field of dredge building. It has probably come into existence under protection of the country's tariff, which is very heavy on all manner of shipbuilding. About a year ago the customs exemption period of ten years which had been established in favor of foreign dredges, expired and all the efforts (and they were great and persistent) on the part of the Russian gold producers failed to move the Government from the position it had taken, namely, to allow the exemption to lapse. The consequence is that as the Government did not renew the exemption, the heavy tax operates to the practical exclusion of the foreign dredge builder. That will account for the special efforts of the Sormoff company.

The dredge of the Bogosloff company was constructed by the Nevlansk foundry, and dredge No. 10 of the Zauralsk Mining Co. was built by the Putiloff foundry, which also constructed the dredge operating at the Verchne-Tailinsk gold mines of the Altai Gold Concession Co. after the Bucyrus type. Several of the alluvial deposits are worked by dredges of the New Zealand type, and are constructed by the Korobeinikoff foundry in the Urals, the machinery being made in England. The New Zealand system is likewise employed at the Kungursk mines and at the Elizabetinsky mine and a Dutch dredge is working in the Severnaya Taiga goldfields. The method adopted for collecting information relative to the work of the dredges was the customary one of issuing question blanks and requesting replies to be written thereon. As might be expected, a number failed to answer at all, others did not fill out the blanks; but gave their reasons for refraining from giving details. The total number of dredges for which returns were given was 48. The returns include the period during which the dredge worked; the capacity, the number of working days actually operated; the quantity of material dredged, and the amount of gold and platinum recovered. Quoting from returns for 1909, it is found that in Russia and Siberia the 48 dredges raised 603,352.6 cubic sazhens of ground or sand in 113,634 working hours, and the gold and platinum washed therefrom make a total of 77,378 oz., an average of about 14,715.92 cubic sazhens per dredge out of 41 dredges, and 1812 oz. per dredge. The number of dredges reported to have been at work over the area referred to in 1909 was 55, which is somewhat less than those working the preceding year. This is accounted for by the fact that several large houses, notably the Draga company. The Phedoroffsky company, and the Neviansk company, did not work so many dredges in 1909.

An analysis of the tabulated statement shows that the

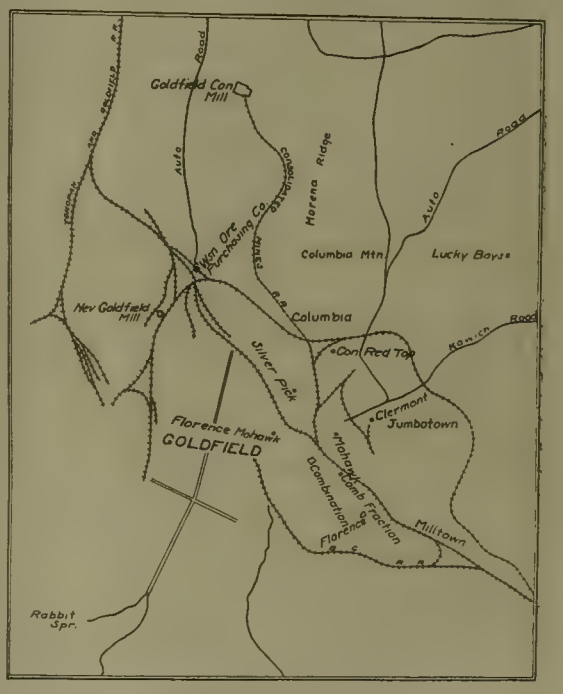
average quantity of material handled during 1909 was an increase of 12.4% over that of the previous year, while the average production showed an increase of 26%. It is interesting to note that the increase in the percentage of gold was nearly twice the increase in yardage handled. From this it is concluded that the operators are using discriminating judgment in the selection of dredging ground. The average content of gold per cubic yard increased in 1909 to 0.123 oz. from 0.109 oz. in 1908.

There is no doubt that dredging will increase over practically the whole area, excepting perhaps the Urals, where the sands have been worked with such persistency that the great preponderance of alluvial gold over vein gold is being rapidly lessened, and those who would work the Urals thoroughly must be content to engage in vein mining. In Siberia, however, no such necessity exists. The gold produced over that vast area, both by hand and machine, including dredges and excavators, is well over 90% from alluvium, so that the future of gold mining there may be said to rest with dredging. Of course it must not be supposed that this statement covers all the gold industries, either deep mining or alluvial, in Russia and Siberia. It deals only with dredge work. There are districts of which no mention is made in the report where excavators, but not dredges, are at work.

GOLDFIELD, NEVADA

Goldfield Consolidated Dividends and Quarterly Report.—Important New Developments.

Dividend No. 9 (regular quarterly of 30c.) of the Goldfield Consolidated Mines Co. was paid to stockholders October 31, and an extra of 20c., being the fourth consecutive quarterly distribution of 50c. per share on the 3,559,148 shares of the company's stock outstanding. Stockholders were also supplied with a statement compiled by J. R. Finlay, the manager, and attested by A. H. Howe, secretary and treasurer of the company, setting forth the production and earnings for the second quarter of the fiscal year. The report made by the manager, covering the quarter ended September 30, shows a total of 70,193 dry tons treated and shipped, the gross value of which was $2,607,852.96. Operating costs for the quarter were $587,822.45, construction $75,000, metallurgical losses $161,968.79, total costs and losses $824,791.24, and net profits $1,783,061.72. The last figure exceeds the amount of the dividend by over $3000. Figures for September were approximate, as settlement for bullion at the mint was not complete, but there will be little variance from these totals. On September 30, as shown in the report, the company's cash balance aggregated $2,558,340.80, and on October 31, after the payment of dividend No. 9, the cash balance was approximately $1,400,000. A comparatively small amount of ore was shipped to smelters during the quarter and all mill products were treated in the company's refinery. The mill is again operating at full capacity of over 850 tons per day, and the company still has a large tonnage of high-grade smelting ore available which can be drawn upon for shipments in the event of its being required to supplement the bullion production of the mill. Development on the 1000-ft. level of the Clermont has produced results during the past fortnight which are regarded by the management as among the most important in the history of these mines. An ore-shoot was penetrated about a month ago on this level, some distance to the southwest of the original discovery of ore at this depth, and for a distance of 35 ft. the ore was of excellent grade, after which the drift ran in material too low grade to treat profitably, then again entered an orebody of gratifying size and value. The drift has progressed 65 ft. in ore said to average $60 per ton, and containing seams of higher grade ore, some of the latter yielding assays of $500 per ton. The orebody is 20 ft. wide at one point. This ore-shoot is thought to be the downward extension of the Mohawk shoot, which has yielded a great quantity of high-grade ore above the 600-ft. level, and particularly from the famous '403' stopes, near the southeast boundary of the Mohawk claim. The vein dips east, toward the new workings, and in character the ore resembles that of the Mohawk rather than the general run of Clermont ore, containing much free gold in quartz boulders and breccia surrounded by talc and pyrite, and carrying but little antimony, copper, or bismuth. The new hoisting engines, of large capacity and electrically driven, will soon be in operation at the Clermont, Mohawk, and Laguna shafts, and all new construction work is rapidly nearing completion, including the storage-battery plant, electrically-operated machine shops, transformer houses, heating plant, and refinery. With the completion of this work a large item of monthly expense will be eliminated, many important factors for economy in operation will be put in effect, and the company's net earnings will be correspondingly enhanced. From officials of the Combination Fraction Mining Co. it is learned that the company is making profit on the 50 tons of ore treated daily at the leased Nevada Goldfield mill of 20 stamps. Good progress is being made in sinking the main shaft of the Florence Goldfield Co., recently enlarged by raising from the bottom, 530 ft. deep, to the surface. Machine-drills are in use and



Goldfield and Vicinity.

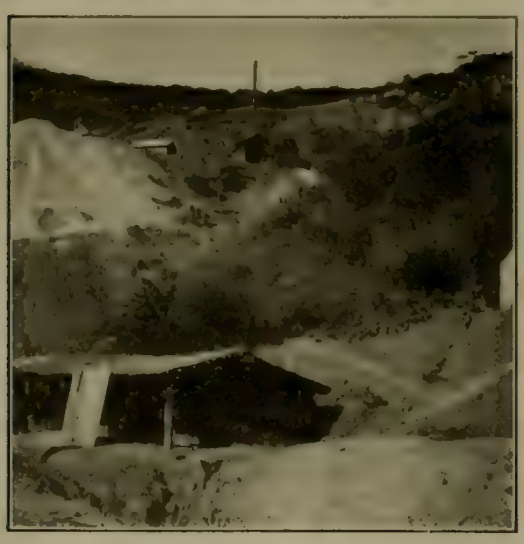
stations will be cut at intervals with pockets for ore and waste. The latter will be hoisted to the upper levels and used in filling. Automatic skips, operating in balance, will shortly be in use and will be of 3-tons capacity each. The ore of the Florence for some time past has been low grade and an effort has been made to clean up everything from the old lease workings from which a profit could be recovered. Some ore of better grade has been coming from the vein opened on the 350-ft. level north of the main workings and near the old bonanza Reilly lease. Stopes are being opened in this vein for 300 ft. and there is promise of a large tonnage of milling ore of medium grade. New levels will be started from the main shaft below the 500-ft. point, driving for orebodies that have yielded a good production above that level. Two carload shipments have been made from the Nevada Eagle, situated three miles west of Goldfield, and an orebody is being developed in a raise above the 250-ft. level from the 400-ft. shaft. A mile north of the Nevada Eagle and in similar formation, the Nevada Victor is driving on a promising vein. The Grizzly Bear Co., operating a lease on Consolidated ground, has resumed work on the 1170-ft. level from its 1200-ft. shaft, the deepest in the district. The lease expires February 1 next and the Consolidated company has refused a renewal, but recent discoveries on the 1000-ft. level of the Clermont, near

the leasing company's territory has encouraged the latter to endeavor to find the same ore sheet in its 1170 ft. workings. Several applications have been made for leases on the claims of the Diamondfield Black Butte company where one lessee has been taking out ore of shipping grade from old workings near the Bonanza Flat vein. Five lessees continue operations on the Atlanta the Precious Metals Co driving on the 750 ft. level and the Queen Consolidated Co exploring the vein from which the old Cherokee lease obtained good assays at a depth of 540 ft. One lease is working on the Sunflower claim of the Merger Mines Co and is sinking the vein from which high grade ore was taken and shipped by the Ford lease near by. The Manning lease on the Goldfield Ono is prospecting near the surface and sinking the old Ono shaft to greater depth.

MEXICO

Railroad Extensions Contemplated.—Important Consolidation. — New Hydro-Electric Power Plants.

Much construction work is planned by the National Railways of Mexico and it is expected to add 2000 kilometres of new track to the mileage of the government merger system within the next few years. The lines projected will open rich territory, and several mineral districts will be benefited. One of the roads included in the program is that planned to extend from Gutierrez, on the Mexican



Magistral Mine, Ameca District, Jalisco.

Central main line, through Zacatecas and Durango to the City of Durango, about 155 miles, and the line will serve the Sombrerete, Chalchihuites and Nieves mining districts of Zacatecas, and the Nombre de Dios district of Durango. Subsidies have been granted by the governments of Zacatecas and Durango, and some financial assistance will be given by private interests in view of transportation benefits. Work has been commenced on a line from Penjamo a station on the Guadalajara division, south through the State of Michoacan to a connection with the Acambaro-Uruapan line of the merger system at Ajuno, a distance of 125 kilometers. The narrow-gauge Acambaro-Uruapan line is being shortened and widened. A rich portion of the State of Tamaulipas will be opened by the construction of a railroad south from Matamoros to the Gulf port of Tampico, and from Tampico an extension will be built through the State of Veracruz to the port of Veracruz. This line will connect with the present system at some point in the State of Hidalgo, thereby establishing a short route to Mexico City. Early this year the Durango government granted a concession for a railroad from Tepehuanes, the Mexican International terminus, into the Guanacevi mining district. The surveys have been completed and the district is being canvassed to determine probable freight. The concession carries the State's guarantee of 6 per cent interest on the money invested for a period of 2 years. It is stated that J. G. White & Co. of New York will build the line. According to late advices the merger of the Dolores Mines Co and the El Raco Mines Co., both in Chihuahua with the Mines Company of America owning the Creston Colorado and La Dura mines in Sonora is practically accomplished. The capital of the Mines company has been increased from $2,000,000 consisting of 2,000,000 shares of a par value of $1 each, to $5,000,000, consisting of 2,000,000 shares of a par value of $2.50 each. Of the new stock, 400,000 shares will be used in acquiring the same number of shares of Dolores stock par value $5, and 249,911 shares will go to the holders of the 357,020 outstanding shares of El Raco, par value $2. After all stock transfers are made the Mines company will have stock of a par value of $500,860 for use in obtaining funds for additional properties and improvements. Dividends paid by the three companies in 1909 totaled over $1,000,000. A few months ago the Mines company took over the properties of the La Dura Mining & Milling Co in the Yaqui river region of Sonora, and these properties are now being operated under the Mines company management. The La Dura mines have been steady shippers of high grade ore for many years.——The Elmore flotation process has been discarded by the Magistral Ameca Copper Co., of Los Angeles, operating in the Ameca district of Jalisco. It proved satisfactory only in treatment of absolutely clean sulphide ores. The Magistral Ameca was the first concern in Mexico to give the Elmore process a trial in the treatment of copper ores, and much interest was manifested in the results. Jigs, also, have been discarded by the Magistral-Ameca, and the treatment now consists of concentration on Wilfleys, tube-mill regrinding of middling and tailing, and slime table treatment of the slime. This method having proved satisfactory, the plant is to be enlarged to treat 150 tons daily. Screen troubles, resulting from an excessive amount of sulphuric acid, have curtailed production recently.——The Almoloya Mining Co., of Mexico City, operating near the Magistral in the Ameca district, has paid its first dividend, 2 per cent on the capital of ₱20,000. A small plant is producing from two to three tons of concentrate daily. It will be enlarged during the coming year. ——The ambitious plans of the Mayo River Power & Land Co., of Denver, are again attracting attention, due to the announcement that funds for the projected power plant on the Mayo river in Sonora have been secured. A concession for hydro-electric development on the Mayo was obtained last year, and if a plant be built, power will be transmitted to Sonora and Chihuahua mining camps. The company plans are not confined to the Mayo river, but include hydro-electric installation on the Humaya river, in Sinaloa, and on the Santiago river, in Jalisco, or Tepic, with long transmission lines to many sections of the west coast territory. There is promise of great development along the west coast of Mexico during the next several years, and with the opportunities that exist for hydro-electric installations, cheap power should prove an important feature of this development. Engineers in the employ of the Denver company have measured the flow of all principal west coast rivers at the end of the last dry season.—— An 89-mile transmission line, from Guanajuato to San Luis Potosi, has been completed by the Central Mexico Light & Power Co., a subsidiary of the Guanajuato Power & Electric Co. The distance from Guanajuato to the generating plant, in the State of Michoacan, makes the total transmission nearly 200 miles. The San Luis Potosi electric plant and distributing system were purchased some months ago for $700,000. The new line is delivering power to the Providencia San Juan de la Luz mines in the San Felipe district of Guanajuato, and later it is expected to deliver power to the San Pedro district of San Luis Potosi.——A concession was recently granted for a transmission line from the Copper Queen smelter at Douglas, Ariz., to the El Tigre district of Sonora, and it is expected to have the line completed before the middle of 1911. Power will be furnished the Lucky Tiger and other properties.

The September reports of the El Oro Mining & Railway

Co. and the Mexico Mines of El Oro, both controlled by the Exploration Co., Ltd., of London, show profits, respectively, of $92,580 and $82,190. The ore milled by the El Oro Mining & Railway amounted to 30,012 tons, and produced $199,140. The month's profit from the railway was $4000. The ore crushed in the 40-stamp mill of the Mexico Mines totaled 11,710 tons, producing $129,160. The annual meetings of these two companies were held recently in London, and reports for the year ending June 30 last were submitted. On that date the reserves of the El Oro Mining & Railway amounted to 441,639 tons, or approximately 15 months' supply at the present rate of milling. The total production for the year was $2,562,705, the total profits £227,192, and the dividend distribution £172,125, or 15 per cent. The total revenue of the Mexico Mines was $1,392,336, the profits totaling £154,990, and the dividend payments £126,000. The ore reserves at the end of the year amounted to 283,735 tons.——The successful development of the Juan Casiano field in the State of Veracruz by the Huasteca Petroleum Co. is proving of benefit to the Waters-Pierce Oil Co. in its war with the Pearson-Aguila interests, as a contract for the delivery of 2,500,000 barrels of oil to the Waters-Pierce refinery at Tampico has been made. It is stated that the Huasteca company will receive 92½ cents gold per barrel, or a total of $2,312,500, and that an advance payment of $250,000 has been made. The contract means that the Waters-Pierce will be able to greatly curtail imports. The Huasteca company has let a contract for a concrete storage reservoir of 500,000 barrels capacity, and later, if the production increases, a second concrete reservoir, possibly of greater capacity, will be built.

Control of the Hidalgo Mining Co., of the Parral district of Chihuahua, and the Parral & Durango railroad has been acquired by men principally interested in the Alvarado Consolidated Mines Co. and the Palmilla Milling Co. The deal was made by A. J. McQuatters, and is stated to involve $1,500,000. James I. Long, who has been in general charge of the two enterprises, confirms the sale of control. The deal means extensive work at the Hidalgo properties and may result in the extension of the Parral & Durango railroad.——The remodeled and enlarged smelter of the Rio Tinto Copper Co., in the Terrazas camp of Chihuahua, is now ready to handle up to 600 tons daily. Converters have been installed, and blister copper will be shipped.——The San Carlos Gold Mines, Ltd., the English concern owning the Mezquital and San Carlos groups and a 50-stamp mill and cyanide plant in the Mezquital del Oro district of Zacatecas, is averaging two bars of gold and gold-silver-copper bullion weekly. The bars are shipped to the Bank of London & Mexico at Guadalajara, and range in value from ₱6000 to ₱7000. English interests have owned these mines for a number of years, and several reorganizations have taken place. For a time substantial dividends were paid.

LOS ANGELES, CALIFORNIA

Gold Road Mine.—San Antonio Copper.—Meeting of Oil men.

The Gold Road mine, operated by the Gold Road Mining & Exploration Co., situated 24 miles northwest of Kingman, Mohave county, Arizona, and the same distance northeast of Needles, is preparing to increase its capacity to 300 tons per day. Recently two Chilean mills were installed, but they are not yet taking ore, as the shafting was broken when power was turned on. Repairs are being rushed. In the meantime the mill, of 40 stamps, two 5 by 22-ft. tube-mills and a cyanide annex, is treating 200 tons per day. The mine is developed by an 835-ft. shaft, from which 2000 ft. of stoping ground has been opened. Over 7000 ft. of drifts are open on the various levels. The ore averages about $9 per ton in gold with a small amount of silver.——The shaft of the Johnnie Mining & Milling Co., fourteen miles from Amargosa, Nevada, is down 930 ft., and preparations are being made to continue to the 1000-ft. level. A cross-cut is being driven on the 900-ft. level which is expected to reach the orebody in a few days. The ore now going to the mill averages above $10 per ton in gold. Plans for the next year include the installation of mining and milling equipment that will bring the capacity up to 150 or 200 tons per day. The mine is now developed to the point where this capacity is possible, but the equipment permits the handling of only 50 tons per day.——The San Antonio Copper Co., situated in the southeast corner of the Ures district, Sonora, Mexico, at the terminus of the Rio Yaqui & Pacific railroad, has completed surveys for a 4400-ft. adit to tap the vein 1200 ft. below the apex. The adit will be double-tracked and the portal will be about 2½ miles from the smelter site. The property is developed almost entirely by adits, of which there are 19, the longest being 1200 ft. About 30,000 ft. of work has been done. H. L. Miller, of Los Angeles, and associates, operating the Libertad and other claims to the south of the San Antonio property, are developing with a force of 20 men. Here nine adits, varying from 100 to 400 ft. in length, have been driven. The San Antonio vein is in quartz-porphyry, standing almost vertically and striking north-south; the Libertad vein is just beyond the contact, in slate, and strikes northeast-southwest. Although there are many prospectors in this district, the above operations are the only ones of magnitude.——The following call has been set out to the oil men of California: "In order to arrive at the best method to pursue in an effort to induce the Government to take immediate remedial measures in behalf of those operating in good faith upon Government land, whose interests have been affected for the worse by late interpretations of the laws governing mining claims, it has been determined to call together all those interested directly or indirectly in the matter; and all those to whom this is addressed are hereby earnestly urged to attend a meeting to be held at Bakersfield on Saturday, November 12, 1910, at which time and place it is hoped a plan will be suggested and approved whereby the rights of the said operators may be secured in accordance with the implied promise of the Government, and the general understanding of the laws in the light of rulings and decisions obtaining up to a recent date." The meeting will be held under the auspices of the California Oil Men's Association, Western Producers' Association, Kern County Board of Trade, and Coalinga Chamber of Commerce.

NEW YORK

Prosperity in Crops.—Silver Higher.—Copper Situation.—1000 Stamps for Alaska.

In New York attention is concentrated on politics and in Wall Street it is 'Anything to beat Roosevelt.' Aside from this distraction, market conditions are improved. Crop returns and crop financing were alike elements of uncertainty. Eight billions in corn, wheat, cotton, and other products added to the country's wealth, and the moving of such an enormous tonnage without undue financial strain, form a foundation for broad operations, and as soon as the decisions of the Supreme Court point the way in which certain projects must be carried out, it is expected some large enterprises will be put together as new leaders for the market. Silver has maintained an average price throughout October of 55 $^{9}/_{16}$c. per ounce. The high mark for the year was 56⅞c., reached in October. Silver producers are particularly encouraged by demands of the Orient. The stimulus to the silver mining industry which will follow the metal market improvement will be most apparent in those districts having large low-grade orebodies. In copper, the improved conditions are considered a triumph for the advocates of curtailment. Consumption of copper continues to climb to record-breaking proportions and that the metal goes into use is shown by a marked decline in the foreign visible supply. The metal market is announced as sold out for 1910 deliveries, while one of the largest of the selling agencies announces heavy sales made for January delivery, which is quoted at 13c. with higher prices in prospect. So long as the present rate of consumption is maintained the big producers will exercise caution in advancing prices, relying rather upon the volume of business than upon profit per pound.

One of the remarkable financial movements of recent

years to the control of copper interests and the close relations of the more powerful factors. It has been thought that so far as production is concerned an agreement had been reached covering not only curtailment for market purposes but also the development of new properties a sort of amicable division of territory leaving open smelting profits and metal brokers commissions. There is recent evidence that competition here has also been eliminated. Not long ago the Montana made a contract with the Cole-Ryan interests to send its ores to the Greene Cananea smelter. This was supposed to merely emphasize the alliance of the Lewisohns with the Cole-Ryan Amalgamated and Standard Oil crowd. Now the Lewisohns have made another smelting contract this time with the Guggenheims who hereafter will handle the ores of the Tennessee Copper and will also have the selling of the 14,000,000 lb. of copper produced by the Tennessee. Inasmuch as this means direct loss to the United Metals Selling Co. in commissions, and as control of Tennessee rests with the estate of Leonard Lewisohn, the only conclusion to be drawn is that copper producers, smelters, refiners and selling agents have come much closer together than the public thought.

The rumored dividend of the Granby failed to materialize. The company has, however, taken steps in the line of the campaign promised, in the purchase of control of the Hidden Creek Mining Co., which is said to own the largest copper deposit in British Columbia. These properties are at Goose Bay, on Observatory Inlet, near the Alaskan boundary. Calaveras Copper, which has been having a somewhat spectacular career on the Boston curb fell from $7 to $1.87½ in one day. It was said the slump was owing to a forced sale of stock held as collateral.

The 200-stamp mill of the California Nevada Copper Co., on the Ebner property near Juneau, Alaska, is going up rapidly. The stamps in this mill weigh 1500 lb. each and will drop 105 times per minute. The ore of the Ebner is said to be free milling and to run about $3.50 per ton. The equipment now under construction is the first unit, and plans contemplate the installation of 1000 stamps as quickly as possible.

A reorganization is to be effected of the Alvarado Consolidated Mines Co. and the Palmilla Milling Co., originally organized to exploit the old Palmilla mine at Parral, in Chihuahua, Mexico. The Boston people concerned have taken the property over in fee simple. The present plan contemplates the formation of a company to be known as the Alvarado Mining & Milling Co. The old stock in the two companies will be exchanged on a basis of two shares for one, that is, two shares of Alvarado Consolidated or two shares of Palmilla Mining, or one share of each, for one share in the new company. After the exchanges are completed it will leave 200,000 shares of new stock in the treasury to be used for the purchase of other properties. A new cyanide mill on the property is about completed and will go into operation as soon as the aerial tramway from mine to mill is finished.

BUTTE, MONTANA

North Butte and Tuolumne Negotiations Dropped.—Amazon-Montana.—Parrot.—Ohio-Keating.—Raven.

The negotiations between the North Butte and Tuolumne companies for a settlement of their differences have ceased, according to latest reports. It is impossible to secure official information as to the nature of the offer made by the North Butte company, but it is reported that the Tuolumne would not sell upon a basis of less than $8 a share, while the North Butte people would pay no more than $6 a share. It is generally understood that W. A. Clark has not taken up any of the bonds to which he was entitled in proportion to his holdings of Butte & Superior stock. There is an unofficial statement that, of the $1,000,000 bond issue, the stockholders took $250,000, an Eastern bonding company $500,000, and the remainder will be taken by Duluth people. There is a belief that some deal as to finances is still pending with W. A. Clark, as it is said a shipment of 1000 tons of ore is being made to his concentrator. Walter Doe, who is in charge of the Abe Lincoln mine in the Moose Lake mining district west of Anaconda, has gone East to consult with stockholders in reference to improvements and development. He recommends a plant for the treatment of the ore.——According to reports from the Amazon Montana Development Co. at Amazon, 6 miles east of Butte, some fine ore has been discovered. It is stated that the crosscut has intersected a vein 8 ft. wide at a depth of 250 ft. In the bottom of the winze on the main ore shoot, at a depth of 40 ft., ore was found an average sample of which assayed 10.2 oz. silver, 26.6% lead, 2% copper, and $2.50 gold to the ton, a total value of about $32 to the ton.——It seems a good thing for Parrot stockholders that the property was purchased by the Anaconda company otherwise it is uncertain when they would receive a dividend. In 1900 the Parrot paid a dividend of $6. In 1901 it paid $4.50, and the next year 50 cents. The following year it was passed. In 1904, $1 was paid, and in 1905, $2. In 1906 it was $1.25 and in 1907, 75 cents. The two following years the dividend was passed. Since the property was sold to the Anaconda company the Parrot company is again in a position to pay dividends from the $180,000 a year it is getting in dividends from the 90,000 shares of Anaconda company stock which it received from the sale. The first dividend since 1907 was 15 cents on September 7 of this year, which has been followed by another of 15 cents a few days ago. There is a belief that the action brought by the minority holders of Parrot stock will never come to a hearing, but that the petition for the appointment of appraisers to value the property will be dismissed by the men bringing the action, with the understanding that the Parrot company be dissolved and that the 90,000 shares of Anaconda stock held by the company be divided among the stockholders pro rata.——A special meeting of the Ohio-Keating Gold Mining Co. has been called for December 3 by directors to place before the stockholders a proposition to raise money. It is proposed to increase the capital stock from $500,000 to $1,000,000, and to offer a part of the new stock to stockholders, and the unsubscribed portion to the public; to authorize a mortgage-bond to care for the present indebtedness and for future requirements, and also to consider the advisability of consolidating with other companies, or of selling all of the company's assets. The property of the Ohio-Keating is at Radersburg, in Broadwater county, and several months ago in New York there was a merger under consideration with a concern in California, but it seems that scheme fell through, and now another way is to be taken to raise money. According to reports from company officers a short time ago, an excellent showing was being made.——There is a feeling of satisfaction in Butte over the announcement that the Raven company has made arrangements with the Amalgamated Copper Co. which will enable it to work the Snoozer claim, adjoining the Amalgamated properties. The Raven owns ⅔ and the Anaconda company ⅓ of the Snoozer claim. Development proceeds in the Raven and the agreement entered into with the Amalgamated gives promise of great things for the Raven people.——The quarterly report recently issued by the North Butte Mining Co. shows that extensive development has been done since the last report and that some valuable orebodies have been opened. Altogether the property is in a much better condition than for a long time. The Speculator shaft has been sunk an additional 120 ft., and the skip, chute, and station at the 2400-ft. level have been completed. Sinking is now going on to reach a depth of 2800 feet.

The Tuolumne Copper Mining Co. is shipping daily to the Anaconda smelter 230 tons of ore which runs 11% copper. While there is a force of men mining and hoisting ore, there is also a large force engaged in development work, and the company is proceeding along the lines that there is no question as to the future of the property, to the value of its ore, or to it remaining in the possession of the present owners. Mr. Harrington, the secretary, says that the company is earning good money on the present market value of copper, while Mr. Sheehan, the superintendent, is authority for the statement that the supply of ore in the new strike is practically unlimited.

General Mining News

ARIZONA

GILA COUNTY

(Special Correspondence.)—D. C. Jackling, manager of the Ray Consolidated Copper Co., and a party of friends arrived in Globe, November 3, for the purpose of examining the property of the Inspiration Copper Co. and making a trip through the Globe-Miami district. Mr. Jackling and some of his associates are supposed to have become financially interested in the Inspiration mine.——The Miami Copper Co. is employing 600 men, of whom only 75 are underground. The remainder of the force is engaged in constructing and equipping the concentrator and auxiliary buildings. The company has provided foundations for three additional units at the concentrator site, but the equipment for increasing the capacity of the mill from 2000 to 3000 tons will not be added until conditions warrant. It is estimated by the management that one year from now the mine will be producing 2000 tons of ore every 24 hours with a force of 350 men.——The Arizona-Colorado Copper Co. has a small force on development on the second and eighth levels. Two machine-drills are in operation, one on a stope in the eighth level, where a vein 8 ft. wide is being worked, and the second on the 200-ft. level, where a cross-cut is being driven south from the shaft to open a vein 30 ft. from the station. This cross-cut is now in 15 ft. From the eighth level stope about 15 tons of ore averaging 4% copper is being extracted daily.——All efforts of the Arizona-Michigan Mining Co. to find ore are now confined to sinking a winze on the Old Dominion fault below the fifth level.——The Superior & Boston Copper Co. is employing 75 men. The underground work consists in driving two drifts on the eighth level and of sinking the McGaw shaft. This shaft is 940 ft. deep.

Miami, Arizona, November 5.

YAVAPAI COUNTY

(Special Correspondence.)—The Haynes Copper Co. at Jerome is developing. The work at present is in oxidized ore containing gold and copper. Three shifts, totaling 25 men, are employed. Electric pumps handle the water and are giving satisfaction. T. E. Campbell is superintendent and general manager and William Jansen is foreman.——The Arkansas & Arizona property north from Jerome has resumed after a shut-down of several months. The present work consists of sinking and putting stations in the main shaft. Electric pumps have been installed. Charles Lynch is superintendent.——The Jerome-Verde Co., whose property lies just east of the town of Jerome, is sinking the main shaft, which is down over 500 ft. When the 700-ft. point is reached, driving will begin. Twenty men are employed.

Prescott, November 4.

CALIFORNIA

CALAVERAS COUNTY

The North Star mine near Angels has been recently equipped with a 20-stamp mill. The Angels mine is in operation, and the Utica is expected to resume operations soon.——The Gold Cliff mine, at Angels, has been equipped with a new 20-stamp mill which is run by electricity.——The Schmedake mine, west of Angels, has been bonded to an English company.——The Tulloch mine, south of Angels, is in operation.——The Silver valley reservoir is about finished and will soon be able to furnish a steady supply of water to mines near Angels.

MODOC COUNTY

(Special Correspondence.)—The Ft. Bidwell Con. Co. is installing a 5-stamp mill at its property in the Hoag district. It is expected to have this plant in operation early in December. The mill will be built at the Mountain View, where milling ore has been developed. An aerial tram line is being constructed from the Sugar Pine claim to the millsite, and ore from this property will also be treated. In the latter property rich ore was recently reported. Algernon Del Mar is manager.——The Big Four company has placed an order for a 5-stamp plant, and expects to commence ore treatment before the end of December.——It is expected to have the recently completed custom mill in operation as soon as the fall rains supply sufficient water.——Vigorous work is under way at a number of properties with promising indications.——At the Hess mine, near Adin, the company is constructing a bunkhouse and preparing to increase its force to 30 men.——Some promising ore is being opened in the Dixie Queen.——Prospecting in the hills around Adin is unusually active, the search extending over a wide area.

Alturas, November 2.

NEVADA COUNTY

The channel of the Oak Flat mine near Columbia hill has been cut in a raise from the drainage adit driven through the bedrock beneath the channel. Where the raise reached the channel it is evident that it is on the rim, consequently the adit will be extended and the bottom of the channel sought. Arrangements will be made to wash the gravel as soon as it is available.——A find of rich ore in the Cassidy mine, adjoining the Enterprise at Grass Valley, is reported. The vein is 2 ft. wide. As soon as development warrants it, a mill will be built.

PLACER COUNTY

A drift from the bottom of the shaft of the Standard mine in Sailor ravine, east of Forks House, is cutting stringers of quartz which carry rich arsenical sulphide. It is thought the pay-shoot is near.

SIERRA COUNTY

The York custom mill, near Downieville, is crushing ore from the Mexican mine, on the South Fork of Feather river.——S. W. Van Sycle is working the Keystone mine near Sierra City, under option. An electric-power line is being built to the mine.——At the Cremone mine it is said the vein is a dike 40 ft. wide carrying gold from wall to wall.——George Jones has located a dike 100 ft. wide at the forks of Wolf creek that carries gold and copper.

COLORADO

CLEAR CREEK COUNTY

What has been done at the new camp of Beshears directs attention to a comparatively unprospected belt extending from Boulder county through Gilpin and Clear Creek into Summit county. There is a general opinion that more thorough prospecting will lead to the discovery of valuable orebodies, not only at Beshears, but at other points in the same zone. Beshears is at an altitude of 11,000 feet.

LAS ANIMAS COUNTY

At least 35 men were killed by an explosion in mine No. 3 of the Victor American Fuel Co. at Delagua on Tuesday last. The bodies of 35 men were found in the north entry where the explosion occurred. Four men were rescued, though Willis Evans, a young engineer of the Colorado Fuel & Iron Co. lost his life in the rescue of four miners. He was an assistant on the C. F. & I. Co.'s rescue car. The rescue car of the United States Bureau of Mines in charge of J. C. Roberts arrived at the mine Wednesday morning, and he and his men at once began work with the company's men.

TELLER COUNTY

Following is a statement of the tonnage and value of ore from Cripple Creek district treated during October:

	Tons.	Average Value.	Gross Value.
Golden Cycle	25,660	$20.00	$ 513,200
U. S. R. R.	12,800	22.00	281,600
Portland (Colo. City plant)	10,000	20.00	200,000
Portland (Battle Mt. plant)	8,000	3.50	28,000
Stratton's Independence, est.	8,000	3.50	28,000
Smelters	4,315	65.00	380,475
Total	68,775		$1,432,075

IDAHO

SHOSHONE COUNTY

(Special Correspondence.)—The Tiger Poorman Mining Co., whose mine is at Burke in the Coeur d'Alene district which has distributed more than $3,000,000 in dividends, will go out of existence and the property idle since 1905 will be abandoned. The petition for dissolution was signed by Bruce Glendenning, president, and W. J. Hall, secretary. The expense of handling water was very large and at the 1900-ft. level the task proved too great.—The Northwestern Smelting & Milling Co. will also go out of existence on November 25. The corporation operated for years in connection with the Tiger Poorman company.—The Hecla Mining Co. at Burke paid a monthly dividend of 2c. a share,

Helmet Used by U. S. Bureau of Mines in Rescue Work.

or $20,000, for October, bringing the dividends paid to date to a total of $1,070,000 on a capital of $250,000.

Spokane, November 5.

KANSAS

CHEROKEE COUNTY

(Special Correspondence.)—At Galena preparations are being made for still greater activity. Chief among important transactions is the purchase of the old Southside tract which has produced thousands of dollars worth of ore. Franklin Playter has plans for putting the tract on its old basis. Most of the old machinery has been discarded as unfit for further use, and modern machinery will replace it. A pump with a capacity of 1500 gal. per minute has replaced the old pump used in the Nevada shaft. This new pump will drain most of the Southside tract and make it possible to employ a large force at once. New prospects will be opened as well as the old shafts. The upper runs will be developed while sinking to the rich lower levels which are untouched.——The Nymo plant, which was damaged by a recent storm, has been repaired and is working double shift. Mining has been done at 100 ft. and an ore face 30 ft. high has been carried. Two shafts have entered ore at 135 ft. which assays 6%. A third shaft is used for pumping.——The large Eureka mill which is comparatively new and was built by A. O. Ihlseng and later sold to Robert Ping is running. The mine is operating at 300 ft. the deepest level worked in the entire district. There is a 3-compartment shaft, sunk on the dividing line between the Ping and Robertson leases and ore is taken from both lands. Drifts were first started at 275 ft., but were found to be above the main deposit.——A new drill-hole find has been made on the Clermont land south of Shoal creek which is similar in richness and depth to others on the same land. This company is constantly prospecting and developing its immense holdings and has enough ore in sight to insure steady operation for many years. The last find was between 158 and 173 ft. in black flint. Another recent drill-hole 500 ft. north of the mill shaft showed practically the same formation as well as a deeper deposit in the mill shaft.——Another good prospect has been opened on the Porter tract, across Shoal creek, where 12 ft. of rich ore and 23 ft. of fair mineral were cut in a shaft sunk on a drill hole. The best ore is estimated to run 8 to 10%. The shaft is down 105 ft. and will be sunk 12 ft. deeper. A drill hole east of this shaft shows still better ore.—— The Kramer mill has just been removed from Badger to the Herald lease in Cave Springs, owned by H. L. Kramer. This has been an important mine, developing one of the deepest deposits in the district. But owing to the grade of zinc and the depth of the run, careful milling was required to make ends meet. The old mill was dismantled and the new plant will be tried with more adequate equipment.

Galena, November 4.

MISSOURI

NEWTON COUNTY

(Special Correspondence.)—The old Seneca camp is being developed by local and outside capital as well. Chief among the producing mines are those on the Becker land where prospecting is proceeding on a lease recently acquired; also on the older tracts. The ore being milled is found on a lower level than previously mined. Other producing mines are east of town on the Gallemore land, where galena in abundance is taken from a depth of 15 to 30 ft. There are also silicate and zincblende on the land at deeper levels, but the company will first develop the shallow runs.——Potter and Buskett, who have been developing land west of Diamond, have leased 10 acres to Ivy and Daniels. The ground has been well opened and the shaft furnishes a good supply of ore, which is cleaned on hand jigs. Two shipments have been made. There is some difficulty in the proper separation of the ores, as calamine, galena, and zincblende are all intermixed. But with a new milling plant this will be more easily accomplished. The new lessees have contracted to build a plant during the coming year.——Another new prospect is being developed by W. T. Matters and associates of Neosho, at Henderson, a small mining camp west of Spurgeon. Already a fair amount of lead has been found while sinking. The drill-hole showed good ore from 26 to 36 ft., and the shaft was sunk 3 ft. away. A small prospecting outfit has been put in, including hoist, boiler, and steam-pump. The new prospect is in the midst of old shallow holes which were good producers of ore in an earlier day.——With coal again on the market many mines have resumed operations which were handicapped for lack of it. The old De Masters mine south of Spring City is again operating after being drained, and the Milne silicate mine, just across the road from it, has also resumed operations. Formerly a heavy output of calamine and blende came from here.

Seneca, November 5.

MONTANA

SILVER BOW COUNTY

(Special Correspondence.)—The October copper production by the Butte mines aggregated 22,913,781 lb., against 22,990,050 in September. The total ore tonnage and copper production for the month are given on the following page.

	Tons ore mined daily.	Lb. copper per ton of ore.	Lb. copper prod. in month.
Boston & Montana..	3,000	72	6,696,000
Anaconda	4,000	62	7,688,000
Washoe	400	61	756,400
Parrot	125	63	241,125
Trenton	423	62	813,006
North Butte	1,000	62	1,922,000
Butte-Coalition	1,200	66	2,455,200
Tuolumne	200	70	434,000
East Butte	250	95	736,250
Original	600	63	1,171,800
Total			22,913,781

B. B. Thayer, president of the Anaconda Copper Mining Co., has completed his inspection of the mines in the district. It is stated that after allowing for cost of production, freight, selling charges, and a liberal depreciation, copper is being put down in New York by the Anaconda company at about 10c. per lb. Butte-Coalition operates at the lowest cost of any mine in the district. Mr. Thayer says that mining is to be resumed in the West Stewart, one of the old Clark properties. A spur from the Butte, Anaconda & Pacific railway to the mine has been completed to allow shipment of ore to the Washoe smelter. It is intended to work the Little Mina, of the Parrot company, through the West Stewart shaft.——The Gagnon is hoisting 500 tons a day. The new shaft which was started on the Gagnon ground some months ago is down 1000 ft.——Sinking is proceeding in the St. Lawrence mine. The shaft will be sunk to the 2800-ft. level of the High Ore, with which a connection will be made. All the Anaconda hill mines will be connected with the High Ore for drainage purposes. The 2800-ft. level of the High Ore is the deepest working level in the district, although the Diamond shaft is about 3000 ft. deep.

Butte, November 5.

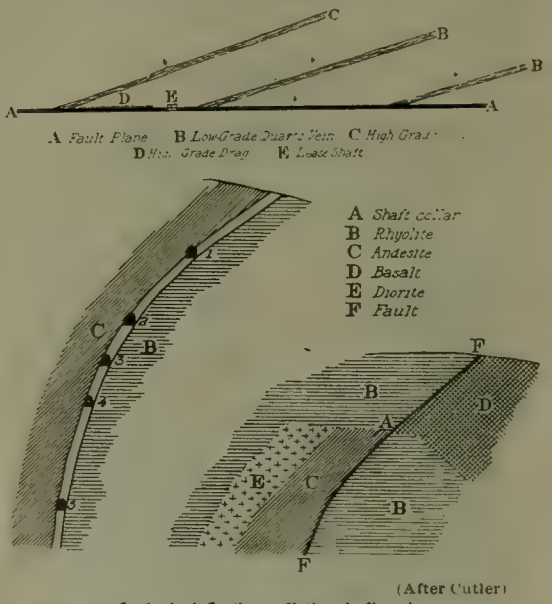
NEVADA

HUMBOLDT COUNTY

(Special Correspondence.)—The Safford lease on the Mammoth claim of the Sheba has opened a large vein at a depth of 10 ft. The vein carries gold, silver, and lead, the two latter predominating. There are several streaks of high-grade ore, assaying up to $400 per ton.——It is reported that 12 ft. of milling ore has been cut by the Charleston Hill Gold Mining Syndicate, at National.——Walker Bros. report rich ore on their Jewsharp Bell claim.——A vein of quartz and talc has been found at the Lady Bud while doing assessment work.——The National Defiance lease shaft is 100 ft. deep, and a cross-cut is being run. A hoist has arrived.——The Butler, Hyde & Prout lease continues in excellent ore. It appears to be the northern continuation of the Charleston vein.——The Crawford Leasing Co., of Salt Lake, has secured the Kekler lease on the Mayflower. This adjoins the original lease of the Crawford.——The Edmonds lease on the Mayflower continues in rich ore. This lease made the second important find of high-grade ore in National——Barret Springs, 8 miles west of Winnemucca, is attracting considerable attention owing to promising discoveries on numerous claims. At the Nineteen Ten a shaft has been sunk 90 ft. with 3 ft. of ore in the bottom. Several streaks of shipping ore were encountered while sinking. Seven sets of lessees are at work on the property. A carload of ore was recently sent out by the company.——The Laurel shaft is down 146 ft. and sinking. A gasoline hoist is used.——A half interest in Remolia No. 1 claim has been secured by G. W. Hartley of New York and T. Defenbaugh of National.

Winnemucca, November 4.

(Special Correspondence.)—The property of the National Mines Co. passed to the control of John E. Pelton and associates September 15, 1909. They had previously purchased the group of four claims of J. L. Workman and Lee Davis, who located them in June, 1907. The unexpired lease of Stall Bros. on a block 300 by 300 ft. was surrendered to the present owners a few months ago, for $250,000. It is reported that this block of ground, after the lease had been relinquished, produced this amount in gold in 28 days. Development on the property aggregates 9000 ft. in drifts, raises, and winzes. Adit No. 4 on the vein gives a depth of 580 ft. at the face. No. 5 adit, starting from the bed of the gulch, has advanced 1100 ft., and when driven beneath the workings of Stall Bros. will be over 900 ft. below the surface. The principal vein, known as the Charleston Hill, is said to have been proved for 2500 ft. Some ore running $20 to $100 per lb. has been shipped by express; other ore is said to sample $1500 per ton; what is designated as mill ore runs $30 per ton. It is estimated there is 6000 tons of mill ore on the dump. A Lane mill, crushing 20 tons per day, has been in operation for some time. The gold occurs free in quartz, talc, and eruptive material. There is a dike of porphyry striking north-south through the district, within which the several parallel veins of ore occur. The accompanying sketch shows the geology of Charleston Hill and of the veins as determined by H. C. Cutler in a preliminary survey of the district.



(After Cutler)

Geological Sections, National, Nevada.

The Auto Hill Extension, owned by J. L. Workman, and leased to Phil Blume, of Winnemucca, is opened by a 200-ft. shaft, from the bottom of which 200 ft. of driving has been done on the Auto Hill vein. The ore is said to assay $12 to $100 per ton. This vein is parallel to the Charleston Hill.——The Radiator, under lease and bond to O'Connell and associates, of Seattle, is opened by a 700-ft. cross-cut to the vein. Sinking and raising are in progress.——The Mayflower, covering another vein, is owned by E. Rhinehardt and W. Critchfield, of Winnemucca, and is leased to R. Edmunds, who has reached the vein by a 400-ft. cross-cut. He intends raising 230 ft. on the vein to the surface. A gasoline hoist is to be installed.——Several sets of lessees are developing on the north end of the National veins, including M. E. Atkinson and Hyde & Prout, the latter having a 200-ft. cross-cut and 200 ft. of driving on the vein.——The Indian Valley lease on a block of National ground, is controlled by E. A. Montgomery, who has sub-leased it to Gordon Campbell and Mr. McDonald. They have found ore and are sinking.——The Shilo group, situated on the south end of the zone, is being developed by George H. Snowden and associates, of Seattle.——J. L. Workman is cross-cutting and driving on the Auto Hill and White Rocks groups. Two veins were intersected by a 300-ft. cross-cut.——The population of National is about 500. It is claimed there are 250 men working for wages, 80 to 100 of this number being employed by the

National Mines Co. The distance to camp from Winnemucca is 50 miles; the automobile fare being $20 each way.—(National, November 5.)

LANDER COUNTY

(Special Correspondence.)—The reconstruction of the mill of the Austin Manhattan Co. has been completed and four electric motors installed. Dry concentration will be employed. The management reports that favorable rates have been secured for the treatment of Austin concentrates. For an emergency fuel supply 200 tons of coal is being placed in bins.—Sinking in the Jack Pot shaft has reached the 300-ft. level and will be continued to the 400-ft. point. From the 300-ft. level a cross-cut has been started.—The retimbering of the Ophir shaft is finished below the 200-ft. level and will continue until the Union vein is reached. The Union portion of the group will be opened through this shaft.—A chute is being built at the station where the Lander adit intersects the Frost shaft, to handle ore from the Independence vein. The Frost shaft is being deepened. Much of the ore for the new mill will come from this point. The Independence will be worked through a cross-cut connecting with the Frost shaft at 570-ft. point.—The Maricopa Mines Co. has put in a compresson at the True Blue, in New York canyon. A 100-ton mill and power plant have been ordered. The True Blue adit to open the Patriot will be driven with three shifts.

Austin, November 3.

(Special Correspondence.)—Battle Mountain, situated on the Southern Pacific, in the northern part of Lander county, is the supply centre for several mining camps to the southeast and southwest, and is the station from which the Nevada Central railroad extends up Reese river 92 miles to Austin. The Shoshone mountain range, between Reese valley on the west and Crescent valley on the east, is a mineralized region, noted in earlier years for the great production of gold and silver of the Dean mine, situated on the west slope, and of the Tenabo and Cortez mines on the east side. A camp of present interest is Kimberly, 18 miles southeast of Battle Mountain, up toward the crest of the Shoshone range. The camp of Kimberly, where there is a good-sized hotel, is at the confluence of two deep arroyos, and the group of 22 claims of the Kimberly Consolidated Mines Co. lies mainly between the two arroyos, which diverge widely as they are followed up toward the summit of the range. On the ridge between the two gulches is a mineralized zone, striking north and south, and approximately 400 ft. in width, the material of which is andesite, quartzite, and porphyry. Within the zone referred to are a number of parallel veins, separated from each other by quartzite and porphyry. On the north end of the group a surface cut on one vein showed it to have a width of 78 ft. between an east wall of quartzite and a west wall of porphyry. The cross-cutting and driving on this vein of quartz disclosed free gold throughout the most of it, with some remarkable specimens. Farther south, on the same zone, from a number of open-cuts and adits, quartz was taken that panned free gold. On the south slope facing the main Kimberly gulch, and near the centre of the group, are two shafts, 70 and 88 ft. deep, respectively, over one of which is a head-frame, and here a gasoline hoist is to be placed. The plan is to sink 400 to 500 ft. at each shaft, and drive cross-cuts to the veins. Besides what appears to be a north-south contact running through the group, there are transverse strata and dikes of quartzite and dacite which enclose the central part of the group in a mineralized basin. The claims of the group were acquired and consolidated by M. C. Scully, general manager for the company. The foundation for a mill has been put in, but further work has been deferred until development is more advanced. S. E. Montgomery, of Battle Mountain, is engaged in ore-testing, sampling, and studying the geological features of the group.——The Pittsburg-Red Top Mines Co. of Los Angeles has 700 acres of patented mineral ground lying between the Kimberly group and the Dean holdings, on which considerable development has been done. In driving a 725-ft. cross-cut several veins were intersected, one of which a 15-ft. raise was made in ore. The cross-cut gives 200 ft. of depth on the veins and a lower adit will give 320 ft. of backs. The veins have a width of 4 to 6 ft., strike north and south in limestone and porphyry, dip west and contain ore that carries free gold and tellu ride of gold in a quartz gangue. A shipment of selected ore assayed $140 per ton. There were six miners at work at the time of my visit and this force was to be increased to fifteen. The work is in charge of J. O. Glover. W. J. Grindle of Los Angeles is manager. The latter states that the company contemplates erecting a concentrating and cyaniding mill.

Battle Mountain, October 26.

NYE COUNTY

(Special Correspondence.)—Portland, Ore., capitalists have bought a large block of stock in the Gold Chief Mining Co., owning a mine in the range northwest of Caliente, Nev. The company is erecting a mill at the Gold Chief mine which is expected to be in operation in December. A pipe line is being laid from Youchum's ranch between Caliente and Panaca. The ore is said to be similar to that at Mercur, Utah, but of higher grade, and it is claimed that there are 50,000 tons of ore developed above the 200-ft. level of the mine.——In a suit brought by the stockholders of the Great Western Mining Co. at Hornsilver, to prevent consummation of a lease and option to purchase given by officers of the company to A. J. Trumbo and associates of the new Bonnie Clare Mining Co., and recently tried at Goldfield, the plaintiffs were defeated. Pending the possible construction of a branch railway from Stonewall to Hornsilver, a distance of 17 miles, a 26-ton traction engine, hauling 6 wagons of 15 tons each, will transport ore from the Great Western to the railroad at Stonewall, whence it goes by rail to the new Bonnie Clare mill, which it is expected will be in operation by January 1, 1911.

Rhyolite, November 5.

(Special Correspondence.)—The Eclipse Development Co. has built a 40-ton mill on Tramp Cons. near Rhyolite and is ready for custom ore. It includes a Vezin sampler. It is reported that the Diamond lessees will put in a gasoline hoist. Shipments of fair-grade ore are being made from workings above the 300-ft. level and from the dump.——The Dreyer lease is sending small quantities of rich ore to the Eclipse mill. The vein is reported to be 3 ft. wide on the 50-ft. level.——A new lease has been taken on the Gibraltar Mines Syndicate by local miners.——The old Lida district is showing activity. The Lida Queen has been leased by Goldfield people and work commenced. The vein is 20 ft. wide with fair gold content. The ore will go to the Pigeon Springs mill. Charles Patrick is manager.——Work has been resumed at the Storm Cloud and the adit is in 1200 ft. A large vein of ore running $10 in gold and silver has been cut.——At the Nevada a 15-hp. hoist has been installed and the shaft will be sunk to 300 ft., where cross-cuts will be driven. The ore assays $12 per ton.

Rhyolite, November 3.

STOREY COUNTY

Preparations are being made to stope ore in the 2400-ft. level of the Ophir mine, on the Comstock. This is the deepest mining, other than development, done on the lode in many years.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence.)—The Ernestine Mining Co., developing in the eleventh level, has 8 ft. of high-grade ore. But 20 stamps were dropped the past week, crushing 554 tons, from which 3 tons of concentrate was produced.——At the Deadwood mines the shaft has been sunk below the 500-ft. level, and a station is being cut. Mill construction is progressing and the tanks are being erected.——The Gold Dust Mines Co. is establishing a camp at the mines.——In the Socorro mines a new orebody averaging $16 per ton has been opened by a cross-cut on the 500-ft. level. Eight hundred tons of ore was milled and the 3-

compartment shaft was sunk 14 ft. during the week.——Enterprise Mining Co. is making progress in retimbering the Perseverance shaft. In the Enterprise the second and third levels are advancing toward the Perseverance.——On the Treasure Mining & Reduction Co. property a force is at work in the mine, and ore is being delivered by wagon to the mill.

Mogollon, November 4.

OREGON

BAKER COUNTY

(Special Correspondence.)—It is reported that the old Highland mine near Baker City has $400,000 worth of ore in the bins and stopes, and is once more in successful operation.

Spokane, November 5.

LANE COUNTY

(Special Correspondence.)—The Blue Bird Mining Co., Blue River, with S. M. Carter as president and general manager, has its 50-ton plant in operation on free-milling gold ore. There is plenty of ore, timber, and water available. The plant is equipped with the Denver Quartz Mill & Crusher Co. machinery.

Blue River, November 4.

UTAH

WASATCH COUNTY

(Special Correspondence.)—Free & Taylor, of Salt Lake, who have the contract to drive the Snake Creek drainage adit 14,350 ft., have run 1800 ft. since June 1. It will terminate in Daly-Judge ground. The size is 6½ by 9 ft. The track has 30-lb. rails and 5 by 7 in. ties, below which is a concave waterway for drainage. They use an electrically driven air-compressor with Sullivan and Pneumatic Tool Co. drills. The formation thus far is blue limestone.

Park City, November 5.

CANADA

BRITISH COLUMBIA

(Special Correspondence.)—With the payment of $71,428 the Queen Mines, Inc., last week took up the bond on the Queen mine, of Sheep creek district. The total price paid was $175,000. M. P. Cannon, of Morrillan, Wis., and G. O. Linderman, of Osseo, Wis., president and secretary of the syndicate, visited the mine last week. There are 15 claims included in the deal. The equipment on the Queen comprises a 5 and 10-drill air compressor, 10-stamp mill, hoisting, and pumping plant. The Queen Mines, Inc., is a close corporation of Wisconsin business men. E. V. Buckley is manager.——The final payments on the Nugget mine were made recently, the price aggregating $40,000. In December the final payment on the Kootenay Belle, amounting to $90,000, will be made, and the property will pass to the Rodgers syndicate. Early in January the Mother Lode mine will pass into possession of John McMartin, of New York. Price, $175.000. Owners of the Kootenay Belle will build a stamp-mill for the Mother Lode mine. The owner, John McMartin, and his engineer, William Watson, left for San Francisco to make arrangements for a 50-ton plant.——A shipment of mixed zinc ores from this district is to be made to Ottawa for a test. Eugene Haanel has made an inspection of the Nelson electro-thermal zinc smelter with a view to determining its adaptability to the tests on a commercial scale.

Nelson, November 4.

(Special Correspondence.)—It is stated that a site has been purchased for the erection of a steel plant within 6 miles of Vancouver, on tide-water. W. Owen, representing British capital, is interested and is negotiating for iron properties within 35 miles of the proposed plant.——Engineers are planning the development of 50,000 hp. on the Puntridge river. This venture is backed by the Canadian Colliers (Ltd.), of Comox, and the power will be used in and about the company's mines. The plant will cost $1,000,000.——Sixty miles north of Vancouver prospectors have located a vein on the seashore that is 400 ft. wide, assaying 2% copper and $1.10 gold and silver. Nearby a bed of gypsum 60 ft. wide has also been located and traced for a quarter of a mile.——In Kamloops district the Iron Mask property should soon be again producing. On the Laura Group, Big Four, Watch Hill, and Arnold properties much work was done the past season. The coal formation north of Kamloops on the Thompson is being explored by the Canadian Northern Coal & Coke Co. by means of diamond-drill.

Vancouver, November 4.

(Special Correspondence.)—The board of directors of the Le Roi No. 2, Ltd., operating the Josie group, declared a dividend of two shillings per share, payable November 8. The managing director of the Le Roi Mining Co. denies that the Great Northern has been negotiating for the mine, but states that there are others figuring on taking over the property. Last week 25 men were put to work underground.——Work on the Blue Bird mine in the south belt is proceeding with satisfactory results and the orebody is still strong. A recent assay returned $81.90 per ton.

Rossland, November 3.

(Special Correspondence.)—Ore shipments from the Boundary district the past week were gratifying, the Granby, Jackpot, Mother Lode, and Rawhide mines showing an increase over the preceding week; in the case of the Granby the increase amounted to nearly 5000 tons for the week.——F. M. Sylvester, of Spokane, has arrived in Phoenix and will take the position of assistant manager for the Granby Consolidated company.

Phoenix, November 4.

(Special Correspondence.)—Mining at the Fife mines was suspended during the past week, pending the installation of more machinery. It is expected that this addition will be completed in three weeks.——It is proposed to sink to the No. 10 level of the Ymir mine in the spring, according to P. F. Jaynes. The No. 10 adit has been driven on the vein for 2160 ft. and is the lowest opening on the property. There is enough ore in the vein, although low grade, to make the Ymir mines profitable under existing shipping and smelting conditions.——The shipments from the Slocan-Kootenay district for the week ended October 22 were 5252 tons.

Nelson, November 4.

(Special Correspondence.)—Eighty per cent of the capital stock of the Hidden Creek Mining Co., owning the largest copper deposit in northern British Columbia, was acquired for $400,000 by the Granby company in Spokane, October 25. M. K. Rodgers, manager of the property, formerly manager for Marcus Daly at the Nickel Plate mine at Hedley, B. C., and who owns the remaining 20 per cent of the stock, refused to sell his interest at any price. Jay P. Graves, of Spokane, vice-president and general manager for the Granby company, announced that a matting plant will be erected as soon as sufficient tonnage is developed. It is the intention to make a low-grade matte and to ship it to Grand Forks, to be converted and smelted in conjunction with Granby ores. It is estimated that there is in sight approximately 400,000 tons of ore containing an average of 3½% copper besides gold and silver.

Spokane, November 4.

MEXICO

OAXACA

In the Santiago Minas, Tlacolula, Teojomulco, Ocotlan, and Zimitlan districts work is going on Steadily.——Recent finds have been made in various mines in the Taviche camps. Wm. Wallace reports shipping ore recently found in his mines; Fuos Bros. have bonanza again in the Veronica, Henry Hale in the Purisima, and J. A. Harreson in the Sanford. The latter reports a body of ore 35 metres wide from which he is shipping.——The latest news of interest received in this camp is that the long-expected custom mill, at Santa Inez Yazachi, near Ocotlan, is an assured fact and that the promoters will arrive in January to resume construction of this mill, which was started five years ago.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

Arthur James is in New York.

H. K. Masters is at Salt Lake.

W. S. Noyes has gone to Texas.

Louis Seyer is at Zacatecas, Mexico.

C. H. L. Solly has gone to New York.

D. E. Bigelow is now at Berkeley, California.

T. N. Bradley left for New York November 5.

L. A. Green has returned to San Francisco from the East.

Nicholas C. Stines is expected in San Francisco November 25.

Ernest A. Haggott is spending November in Arizona on mining work.

F. M. Sylvester is now assistant general manager for the Granby Con. M. Company.

William Rea, formerly operating near Ketchikan, Alaska, is now at National, Nevada.

H. W. Turner is returning from Korea and is expected in San Francisco in a few days.

Geo. Otis Smith has returned from Europe and will visit California late in November.

R. Oliver Uhalt is mechanical engineer for the Santa Gertrudis company at Pachuca, Mexico.

W. G. Post, of Los Angeles, is at Salt Lake. He formerly operated in Wood River district, Idaho.

W. E. King, of the Commercial Mining Co., operating at Rye Valley, Oregon, was at Salt Lake last week.

Ernest Gayford, of the General Engineering Co., Salt Lake, has returned from Butte, Great Falls and Wallace.

Frank A. Bird, of the Bird-Cowan Co., Salt Lake, is engaged in making tests at the Edna mine, near Idaho City, Idaho.

J. R. H. Robertson has been with the East Rand Proprietary Mines, Ltd., since June, when he returned from Rhodesia.

Guy A. R. Lewington, of the N. A. T. & T. Co., has returned from Dawson, Y. T., and will be in San Francisco for the winter.

D. MacVichie and E. E. Price have joined under the firm name of MacVichie & Price to conduct a general mining engineering business with offices at 457 Newhouse building, Salt Lake, Utah.

James C. H. Ferguson, of the Midvale Steel Co., leaves this week for New York en route for a business trip to Brazil, Argentina, and other South American republics. He will be gone about four months.

Bailey Willis has returned from South America, where he has assured the co-operation of Argentina, Chile, and Brazil in the preparation of the one to one million map planned by the International Geological Congress.

JOPLIN LEAD AND ZINC PRICES

Prices for blende in the district were the highest during October, since last March, running up to $49 per ton; and galena sold firm at $54 per ton. Calamine brought $24 to $26. Following are the shipments in pounds of zinc and lead ores during October, according to the *News-Herald*:

Joplin, blende, 2,876,930; lead, 216,790; calamine, 194,070; total value, $59,718. Webb City, blende, 4,970,280; lead, 602,180; total value, $122,808. Galena, blende, 1,322,030; lead, 85,140; total value, $30,649. Aurora, blende, 124,490; calamine, 156,810; total value, $4850. Granby, blende, 60,020; lead, 52,930; calamine, 172,570; total value, $4700. Carl Junction, blende, 140,780; value, $3150. Duenweg, blende, 314,000; lead, 790; calamine, 192,310; total value, $9653. Other districts, blende, 2,757,630; lead, 82,950; calamine, 290,580; total value, $99,209.

Book Reviews

Any of the books noticed in this column are for sale by or can be procured from the Mining and Scientific Press.

The Fight for Conservation. By Gifford Pinchot. Pp. 1-2-5 by 7. Index. Doubleday, Page & Co., New York, 1910. Price 75 cents.

This is Mr. Pinchot's own statement of the plans and purposes of the movement with which his name is so closely associated. It is clear, concise, and temperate. It is as nearly fair as it is possible for a partisan to write, and should be widely read. It includes a general statement of the principles of conservation and strong arguments for their adoption. It should be in the hands of everyone interested in the movement.

A Manual of Practical Assaying. By the late H. Van F. Furman, revised by William D. Pardoe. Pp. 530. Index. John Wiley & Sons, New York, 1910. Price $3.

This valuable and popular book, of which this is the seventh edition, has been completely revised and enlarged. The revising editor has entirely rewritten several chapters, particularly those on determination of silica, lead, copper, cobalt, nickel, and vanadium. A determination for uranium has been added, and also a method for analysis of commercial cyanide. Other important additions and changes have been made, notably in the chapters dealing with tin, antimony, bismuth, arsenic, sulphur, and tungsten. The work is once more up-to-date and its usefulness greatly increased.

More Recent Cyanide Practice. Edited by H. Foster Bain. Pp. 418, Ill., index. *Mining and Scientific Press*, San Francisco, 1910. Price $2.

This book, which is a companion volume to 'Recent Cyanide Practice,' edited by T. A. Rickard in 1907, is just as good as its predecessor, and that is saying a good deal. The most striking thing about the book is the reputation and high standing of the contributors. Most of the articles contain a great mass of information on cyaniding which should be of great assistance to anybody interested in this branch of metallurgy. I often refer to 'Recent Cyanide Practice,' and I expect to do the same with the new volume. The only criticism I have to make is that some of the articles could very well have been left out, owing to the lapse of time since they were published. At the time they were correct, but in the interval the changes made in the plants have made them no longer good examples of cyanide practice. As an example, Rotherham's article on the Montana-Tonopah mill may be cited. That article was a striking one when published, and Rotherham's clear, concise style of writing pictured the mill admirably to the readers of the article. The *Mining and Scientific Press* was fortunate in being able to publish such an article. However, since then Rotherham has gone to South Africa and conditions have changed materially. The practice of today at the Montana-Tonopah is now different from that described in the book. So also with Mr. Parsons' article on the Desert mill, which now is so out of date that dismantling and building a new one in Tonopah is seriously contemplated. Mr. Hanson's article on the Silver Peak mill needs revision now. All these were admirable at the time of publication and are yet valuable as a matter of cyanide history, but in the sense of reliable data concerning modern practice, are misleading. On the other hand, such articles as E. E. Hersam's on 'Power in Crushing,' Kirby's communication, Burt's article on his filter, Boss on 'Ore Crushing,' Holt on 'Cyanidation of Silver Ores,' and many others will be of exceeding value many years from now. I want to congratulate the Editor also on retaining the little personal touches, such as the controversy over the El Oro tube-mill lining. Mr. Foote's letter is delightful, and reading these things livens one up to tackling with renewed vigor the heavy and somewhat dry but more useful other parts.

C. C.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

PRESCRIPTIVE TITLE TO MINING CLAIM

To acquire title to a mining claim by prescription it is necessary that the possession be hostile or adverse, and it must be open, exclusive, continuous, and uninterrupted for a period of five years under the statute of California, prior to the commencement of an action to contest the title. Any interruption of such adverse possession within the five years will prevent the acquisition of the title by prescription.

Big Three Mining & Milling Co. *v.* Hamilton, (Cal.) 107 Pac. 301. Jan. 1910.

PERFORMANCE OF ASSESSMENT WORK

In an action contesting the location of a mine and to quiet title to certain mining claims because of the failure to perform the required assessment work for a certain year, it was held that evidence that a mill put up on one of the claims was of no value for the purpose of reducing the ore found, was properly admissible as bearing on the question of good faith of the parties erecting the mill; but the question of whether or not the necessary improvement work done on the mining claim was not paid for was immaterial in such an action.

Big Three Mining & Milling Co. *v.* Hamilton, (Cal.) 107 Pac. 301. Jan. 1910.

LOCATION OF MINING CLAIM UNDER STATUTE OF 1897

A mining location made while the statute of 1897 was in force, but which was invalid for failure to comply with the provisions of that statute, may still be a valid location if the provisions of the mining laws of the United States have been complied with, and there were no intervening rights before the repeal of the statute of 1897, and where the claim had been occupied, held, and worked up to the time and after the repeal of the statute of 1897; and after tending to show that a claimant had from the time of the location continuously, up to and after the repeal of the statute of 1897, prosecuted and worked under a system tending to the development of the claim and other claims located by him in connection therewith, and that a part of such work had been done within the boundaries of the contested claim, was sufficient to establish possession of the entire claim to the extent of invisible boundaries.

Big Three Mining & Milling Co. *v.* Hamilton, (Cal.) 107 Pac. 301. Jan. 1910.

STATUTE GOVERNING LOCATION AND RE-LOCATION OF MINING CLAIM

Section 1 of the statute of Washington prescribes the duties of the discoverer of a lode in the location of a mining claim; section 2 of the statute requires the discoverer, upon filing notice of his discovery, to locate his claim by sinking a discovery shaft upon the lode to the depth of at least 10 ft.; section 8 provides that the re-location of forfeited or abandoned quartz or lode claims shall only be made by sinking a new discovery shaft and fixing new boundaries in the same manner and the same extent as is required in making a new location, or by sinking an original discovery shaft 10 ft. deeper than it was at the date of commencement of such re-location; section 9 provides that the provisions of the statute relating to the discovery shafts shall not apply to any mining location west of the summit of the Cascade mountains. In a contested location this statute was construed by the Supreme Court of Washington to mean that section 9 applied to re-location of forfeited or abandoned quartz claims under section 8 as well as to original locations, so as to excuse the sinking of a discovery shaft upon re-location of a forfeited or abandoned claim west of the summit of the Cascade mountains.

National Milling & Mining Co. *v.* Piccolo, (Wash.) 107 Pac. 353. March 1910.

Company Reports

BROKEN HILL SOUTH MINING CO.

The report of the Broken Hill South Mining Co., of Broken Hill, N. S. W., for the half-year ended June 30, 1910, has been received. The mine and plant were closed for nearly two months at the beginning of the year, owing to a coal strike in the mines of New South Wales; consequently the report represents the operations for but four months. During that period the ore hoisted and treated was 132,757 tons, containing by assay 15.2% lead, 6.4 oz. silver, 12.8% zinc. Over 99% of the ore mined was by contract. Development work totaled 1580 ft. Over 62,000 cu. yd. of filling was lowered into the mine, of which 20,406 cu. yd. was taken from surface quarries, 36,455 cu. yd. of tailing and 1831 cu. yd. of ashes being used in addition to 3449 cu. yd. of broken rock derived from development. There was employed a total of 1262 men. During the period covered by the report 52,548 tons of zinc tailing was delivered to the Amalgamated Zinc (De Bavay's), Ltd., under contract. During the half year a dividend of £20,000 was paid and another of like amount in July.

LA ROSE CONSOLIDATED MINES CO.

The La Rose Consolidated Mines Co., operating at Cobalt, Ontario, has issued its annual report for the year ended May 31, 1910. The report bears the date October 1. The report shows a production for the year of 3,170,028 oz. silver, which sold for $1,472,005.03. Following is a summary of shipments: Tons of ore shipped, 6,313,905; gross oz. silver, 3,100,443.93; gross silver value, $1,620,341.31; average price per oz., 52.261c.; sales of cobalt, $29,698.11; gross value silver plus cobalt paid for, $1,650,039.42; smelter deduction, freight, and charges, $208,065.33; net value received, $1,441,974.09. Mining and general expense was $448,153.60, or $70.76 per ton of shipping ore, and 14c. per oz. silver. Concentration cost $9.69 per ton of ore; depreciation, $1.49; marketing ore, $34.25; miscellaneous expenses, $0.36. The total net cost of production was at the rate of $116.50 per ton of ore. The estimated ore reserves are valued at 5,544,000 oz. In the operation of these mines, surface trenching to the extent of 5.16 miles was done. Drifting amounted to 5731 ft; cross-cutting, 3046 ft.; raising, 940 ft.; sinking, 342 ft., and stoping, 18,789 cubic yards.

NEVADA CONSOLIDATED

The report of the Nevada Consolidated at Ely for the year ending September 30 shows a net operating profit of $2,345,382, an increase over the preceding year of $699,320. Income from other sources, which includes the Nevada Northern railway, was $1,263,925, an increase of $673,326. Against the total income of $3,609,307 were interest charges of $28,520 and a previous inventory shortage of $125,489, leaving a net balance for dividends of $3,455,298. Dividends paid were $2,982,644, surplus carried forward was $472,654, previous surplus was $2,084,408, making a total surplus of $2,557,062. Production for the year was 62,772,342 lb., which averaged in price 12¾c. per lb. Copper costs for the year were 6.42c. per lb; after depreciation charges were entered, 7.05c. per lb. New tonnage developed during the year was 14,500,555 tons. During the year there was mined 2,236,434 tons of sulphide ore assaying 2.06% copper and 144,381 tons of silicious carbonate ore averaging 2.50% copper. It was expected that there would be some changes in the official roster of the company. A year ago when the Utah Copper Co. first made its offer of exchange, James Phillips, Jr., the president of the company, bore the brunt of a spectacular fight and by a narrow margin retained temporary control. It has been for a long time considered as certain that the Utah people were purchasing Nevada in the open market; their complete control was demonstrated at the annual meeting when Mr. Phillips resigned. The office of president has not yet been filled, but S. W. Eccles, the present vice-president, is mentioned as likely to become the company's executive head. Mr. Eccles is also vice-president of the American Smelting & Refining Company.

OIL DIVIDENDS FOR OCTOBER, 1910.

From the Official Monthly Statement of Oil Securities of the San Francisco Stock Exchange.

Company	Capital	Shares issued	Par value	Acreage	Location	Dividend: Last date	Amount per share	Total to date
Alma Oil Co	$4,000,000	2,000,000	$1.00	120	Kern River	7 15 '10	$ 4	$ 4,000,000.00
Amalgamated Oil Co	[illegible]	[illegible]	100.00	*	Salt Lake Field L. A	9 15 '10	1.00	1,000,000.00
Amer. Petroleum (pfd.)	2,500,000	2,500	1.00	*	Coalinga and Sherman	10 1 '10	66	[illegible]
Apollo	200,000	200,000	2.50	40	Kern River	3 20 '10	1	4,000.00
Associated Oil Stock	40,000,000	400,000	100.00	*	Kern, Coalinga, McKittrick	3 1 '07	1.50	1,548,68.54
Associated Oil Bonds 5s	3,000,000			*	Kern, Coalinga, McKittrick			
Bay City	500,000	100,000	5.00	200	Midway	10 1 '10	10	170,000.00
Blue Moon	200,000	189,759	1.00	20	Coalinga			
Brookshire	500,000	500,000	1.00	933	Santa Maria and Midway	1 1 '10	1	442,500.00
California Midway	1,000,000	922,800	1.00	160	Midway			
California Oil & Gas	1,000,000	900,000	1.00	80	Coalinga			
Caribou Oil & Mining Co	100,000	80,703	1.00	100	Coalinga	10 1 '10	25	341,761.09
Chicago Crude	1,000,000	1,000,000	1.00	100	Kern	3 25 '07	0 4½	15,000.00
Claremont	500,000	500,000	1.00	280	Kern and Coalinga	10 28 '10	½-½	30,000.00
Coalinga Central	500,000	450,000	1.00	120	Coalinga			
Coalinga Pacific	165,000	65,000	1.00	40	Coalinga	12 23 '09	10	107,250.00
Columbia	1,000,000	999,226	1.00	*	Fullerton and Whittier	10 25 '10	½-½	341,[illegible].21
Crescents	320,000	320,000	1.00	40	Midway			
Dabney	1,000,000	1,000,000	1.00	120	Midway			
Del Rey	1,000,000	785,490	1.00	40	Kern River	9 1 '10	0 1½	19,637.50
De Luxe	100,000	100,000	1.00	40	Coalinga			
Eldorado	100,000	100,000	1.00	10	Kern River	8 31 '10	1	
Empire	200,000	200,000	1.00	80	Coalinga	10 30 '10	1	12,000.00
Enos	500,000	358,500	1.00	220	Kern and Santa Barbara			
Esperanze	160,000	160,000	1.00	170	Coalinga	12 27 '09	9	49,450.00
Euclid	350,000	350,000	1.00	10	Kern and Coalinga	8 1 '10	1	141,500.00
Four Oil	300,000	300,000	1.00	20	Kern and Coalinga	2 25 '10	1	213,000.00
Fulton	1,000,000	100,000	10.00	120	Sunset			
Globe	600,000	600,000	1.00	20	Kern River	10 1 '10	1	93,000.00
Graciosa	1,000,000	1,000,000	1.00	*	Santa Maria			
Home	100,000	100,000	1.00	140	Coalinga	20 20 '10	2	488,000.00
Homestake	100,000	10,000	10.00	160	Coalinga	10 13 '10	10	80,250.00
Illinois Crude	200,000	200,000	1.00	10	Kern River	6 1 '10	1	94,000.00
Imperial	500,000	100,000	5.00	2,480	Kern and Coalinga	7 18 '10	8.00	4,000,000.00
Junction	250,000	250,000	1.00	80	Kern River	6 1 '09	1	20,000.00
Kern River	100,000	20,000	5.00	80	Kern River	10 1 '10	10	114,000.00
Linda Vista		385,850		20	Kern River	10 19 '10	1	84,117.00
Luelle	50,000	26,704	1.00	40	Coalinga	12 20 '09	10	42,727.04
Mascot	500,000	500,000	1.00	225	Midway	10 20 '10	2	60,000.00
McKittrick	500,000	500,000	1.00	1,200	McKittrick			
Mecca	500,000	422,500	1.00	120	Kern River	7 15 '09	3	71,825.00
Midway of Oregon	1,000,000	1,000,000	1.00	640	Midway			
Monte Cristo	500,000	500,000	1.00	80	Kern and Maricopa	10 20 '10	10	710,000.00
Mountain Girl	350,000	350,000	1.00	*	Midway	8 4 '10	2	7,000.00
Mexican Petroleum	50,000,000	10,000,000	5.00	*	Mexico	10 1 '10	11⅛	3,578,192.45
M. & M.	1,000,000	1,000,000	1.00	140	Maricopa			
Nevada County	250,000	250,000	1.00	30	Kern River	10 13 '08	4	40,000.00
New Penn. Petroleum	500,000	500,000	1.00	147	Santa Maria	10 15 '10	1	25,000.00
Palmer	2,000,000	1,802,010	1.00	880	Santa Maria	10 25 '10	1	376,501.30
Paraffine	300,000	300,000	1.00	40	Midway	10 15 '10	1	36,000.00
Peerless	1,000,000	100,000	10.00	160	Kern River	9 20 '09	6	801,000.00
Piedmont	500,000	389,000	1.00	10	Kern River	5 9 '10	1	26,877.30
Pinal	200,000	150,000	1.00	*	Santa Maria	10 31 '10	10	991,835.50
Premier	1,000,000	1,000,000	1.00	160	Coalinga	7 20 '10	1	40,000.00
Producers	500,000	80,000	5.00	600	Midway	9 22 '10	50	120,000.00
Radium	250,000	250,000	1.00	*	Santa Maria			
Record	200,000	100,000	2.00	40	Coalinga	10 15 '10	7½	107,500.00
Republic	600,000	500,000	1.00	80	Coalinga			
Rice Ranch	300,000	300,000	1.00	40	Santa Maria	10 10 '10	3	117,000.00
Rico	100,000	100,000	1.00	60	Midway			
Royalty	20,000	20,000	1.00	20	McKittrick	9 20 '10	33⅓	29,400.00
S. F. & McKittrick	500,000	50,000	10.00	151	McKittrick	10 1 '10	30	160,000.00
Sauer Dough	100,000	199,500	0.50	270	Coalinga and McKittrick	10 21 '10	3	559,198.50
Section 7	400,000	400,000	1.00	65	Coalinga			
Section 25	40,000	40,000	1.00	290	Midway	8 26 '10	25	60,000.00
Sesnon	100,000	100,000	1.00	35	Kern River	10 6 '10	6	152,000.00
Shawmut	500,000	500,000	1.00	*	Coalinga			
Silver Tip	75,000	75,000	1.00	20	Coalinga	2 25 '10	10	30,000.00
Sovereign	500,000	500,000	1.00	20	Kern River	9 1 '10	1	100,000.00
S. W. & B.	400,000	377,000	1.00	40	Coalinga	9 10 '09	1	41,470.00
State	100,000	100,000	1.00	20	McKittrick			
Sterling	250,000	250,000	1.00	160	McKittrick and Kern	3 15 '10	12½	778,250.00
Sunset Monarch	500,000	497,241	1.00	*	Sunset and Midway			
Superior	500,000	500,000	1.00	40	Sunset	7 26 '10	1	62,500.00
Thirty-Three	500,000	100,000	5.00	160	Kern River	8 6 '10	4.00	1,090,000.00
Traders	1,500,000	15,000	100.00	410	Kern, Coalinga and Midway	5 15 '10	1.00	209,140.50
Turner	500,000	500,000	1.00	320	Coalinga			
United		80,751		*	Controls Union	10 20 '10	50	2,461,588.43
United Oil	2,000,000	1,283,131	1.00	1,010	Midway	10 10 '10	1	60,088.55
Union	50,000,000	249,626	100.00	*	All Fields of State	10 20 '10	50	7,241,916.15
Wabash	500,000	300,000	1.00	80	Coalinga	10 19 '10	1.00	489,000.00
West Coast (com.)	2,500,000	10,408	100.00	*	Los Angeles			
West Coast (pfd.)	2,500,000	10,408	100.00	*	Los Angeles	9 1 '10	2.00	124,896.00
West Shore	100,000	100,000	1.00	80	Kern River	12 21 '08	5	235,000.00
W. K. Oil	500,000	500,000	1.00	320	Coalinga			
Western Union	1,000,000	10,000	100.00	10,000	Santa Maria	4 15 '07	2.00	484,951.00
Hanford		1,000,000				1 30 '06	22	80,000.00
Kern Oil						11 19 '09	24½	42,000.00
Pittsburg						11 11 '07	43½	124,800.00
Reed Crude						5 31 '10		1,167,500.00

Total dividends for October 1910, $871,508.69; total to date, $36,257,023.53. *Information unobtainable.

CATALOGUES RECEIVED

SCHUTTE & KOERTING CO., Philadelphia. Catalogue 2. Section M. 'Koerting Water-Jet Eductors.' Illustrated. 12 pages. 8 by 11 inches.

RAYMOND BROS. IMPACT PULVERIZER CO., Chicago. Catalogue No. 10. 'Grinding, Pulverizing, and Separating Machinery.' Illustrated. 80 pages. 8 by 11 inches.

The SULLIVAN MACHINERY CO., Chicago. Bulletin 60-D. 'Sullivan Hammer Drills.' Describing the new 'DA 21' stoping drill. Illustrated. 16 pages. 6 by 9 inches.

THE DENVER ROCK DRILL & MACHINERY CO., Denver. Bulletin S C-2. 'Model 8-C Waugh Stoper.' Describing the improvements recently made in this drill. Illustrated. 12 pages. 7 by 10 inches.

THE MINE & SMELTER SUPPLY CO., New York. Bulletin No. 5. Third Edition, September 1910. 'The No. 5 Wilfley Concentrator.' Complete details concerning the timber frame model of this well known table. Illustrated. 20 pages. 7 by 10 inches.

A. LESCHEN & SONS ROPE CO., St. Louis. 'Across the Rio Grande.' An unusually attractive and interesting book descriptive of a recent tramway installation across the Rio Grande connecting this country with Mexico. The tramway is the property of the Del Carmen Mining Co. of Boquillas, Coahuila, Mexico, and is used for transporting zinc ore from the end of a five-mile wagon haul, through some very rough country, across the river to a point in Texas, from where it is hauled 90 miles in wagon trains drawn by traction engines. The tramway itself is 31,500 ft. long. It is equipped with 90 buckets, each carrying 600 lb. of ore and traveling at the rate of 300 ft. per minute. Each track rope is divided into five sections with a tension station weight box at one end of each, the other end being anchored. The weight boxes maintain proper tension under the working strain and against variations in length, due to stretch and changes in temperature. The buckets load and dump automatically, and it is said very little power is required for the operation of the tramway.

COMMERCIAL PARAGRAPHS

The ALBERGER PUMP CO., New York, announces that Braun, Williams & Russell, Inc., 503 Market street, San Francisco, has recently been appointed its Pacific Coast selling agents.

The PACIFIC TANK & PIPE CO. has just completed an office building adjoining its Portland factory, and hereafter the Portland address of the company will be Kenton Station, instead of 210 Wells Fargo building.

THE MINING SUPPLY CO., 64 Broad street, New York, has taken the sole foreign selling agencies for the James ore concentrator table and for Krom rolls, crushers, and screens. Among other interesting facts contained in two attractive circulars recently issued is the statement that 70% of concentrating tables in use in the mills at Cobalt are James tables.

The firm of SMITH & LAIRD, mining engineers, of Bisbee, Arizona, has been dissolved by mutual consent and the name changed to Smith & Ziesemer. Ralph A. Ziesemer, mining engineer, is associated with Franklin W. Smith in the new firm, which retains the same offices and address. George A. Laird continues as manager of the Candelaria Mining Co. of San Pedro, Chihuahua, Mexico, which position he has filled for more than two years.

Under the name of the MCKIERNAN-TERRY DRILL CO. there has been a consolidation effected between the McKiernan Drill Co. and the Terry Core Drill Co. The new company will continue to manufacture the lines produced by the two companies it succeeds, and it is understood that the union of their organization will result in largely improved manufacturing facilities, with consequent better service to purchasers. The various lines manufactured by the McKiernan-Terry Drill Co. include rock, hammer, and core-drills, coal cutters, sheet pile drivers, and compressors. The address of the company is 115 Broadway, New York.

Market Reports

LOCAL METAL PRICES.

San Francisco, November 10.

Antimony	12—12¾c	Quicksilver (flask)	45½—46
Electrolytic Copper	14⅛—15¾c	Tin	38½—40c
Pig Lead	4.70—5.65c	Spelter	7—7¾c
Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50			

METAL PRICES.

By wire from New York.
Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Nov. 3	12.70	4.40	5 94	56⅛
" 4	12.73	4.40	5.95	56¼
" 5	12.73	4.40	5.95	56
" 6	Sunday.	No market.		
" 7	12.78	4.40	5 98	56⅛
" 8	Election.	No market.		
" 9	12.78	4.40	5.98	55⅞

ANGLO-AMERICAN SHARES.

Cabled from London.

	Nov. 2. £ s. d.	Nov. 9. £ s. d.
Camp Bird	1 11 6	1 10 3
El Oro	1 6 3	1 6 6
Esperanza	2 0 9	2 5 0
Dolores	1 5 0	1 5 0
Oroville Dredging	0 7 0	0 7 0
Mexico Mines	7 10 0	7 13 0
Tomboy	0 18 1½	0 18 1½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Nov. 10.		Closing prices, Nov. 10.
Adventure	$ 8¼	Mohawk	$ 50
Allouez	44	North Butte	35¼
Atlantic	7⅛	Old Dominion	42
Calumet & Arizona	57	Osceola	131
Calumet & Hecla	560	Parrot	14
Centennial	19	Santa Fe	1⅛
Copper Range	70½	Shannon	13¼
Daly West	37⅛	Superior & Pittsburg	14½
Franklin	11⅜	Tamarack	58
Granby	44	Trinity	5½
Greene Cananea, ctf	7¾	Utah Con	24½
Isle-Royale	21½	Victoria	2⅜
La Salle	10½	Winona	9⅛
Mass Copper	9	Wolverine	125

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Nov. 9.		Closing prices, Nov. 9.
A. S. & R. Co.	$ 79¾	Miami Copper	$ 19¼
Braden Copper	4⅝	Mines Co. of America	48
B. C. Copper Co.	6¾	Montgomery-Shoshone	⅛
Butte Coalition	20½	Nevada Con	20
Chino	20⅞	Nevada Utah	1⅜
Davis Daly	1 15/16	Nipissing	10 13/16
Dolores	5¼	Ohio Copper	1⅞
El Rayo	3 11/16	Ray Central	2
First National	2⅜	Ray Con	19⅞
Giroux	7⅛	South Utah	1 9/16
Goldfield Con	8	Superior & Pittsburg	14½
Greene Cananea	7 11/16	Tenn. Copper	35
Guanajuato Con	¾	Trinity	6
Inspiration	9⅝	Tuolumne Copper	4
Kerr Lake	6 9/16	United Copper	5⅜
La Rose	4¾	Utah Copper	48½
Mason Valley	9⅛	Yukon Gold	3 15/16

SOUTHERN NEVADA STOCKS.

San Francisco, November 10.

Atlanta	$ 13	Mayflower	$ 6
Belmont	4.50	Midway	21
Booth	8	Montana Tonopah	95
Columbia Mtn	2	Nevada Hills	2.40
Combination Fraction	28	Pittsburg Silver Peak	60
Fairview Eagle	40	Rawhide Coalition	16
Florence	1.75	Rawhide Queen	—
Goldfield Con	8.10	Round Mountain	38
Gold Kewenas	6	Silver Pick	8
Great Bend	3	St. Ives	17
Jim Butler	30	Tonopah Extension	1.05
Jumbo Extension	25	Tonopah of Nevada	8.50
MacNamara	28	West End	52

(By courtesy of San Francisco Stock Exchange.)

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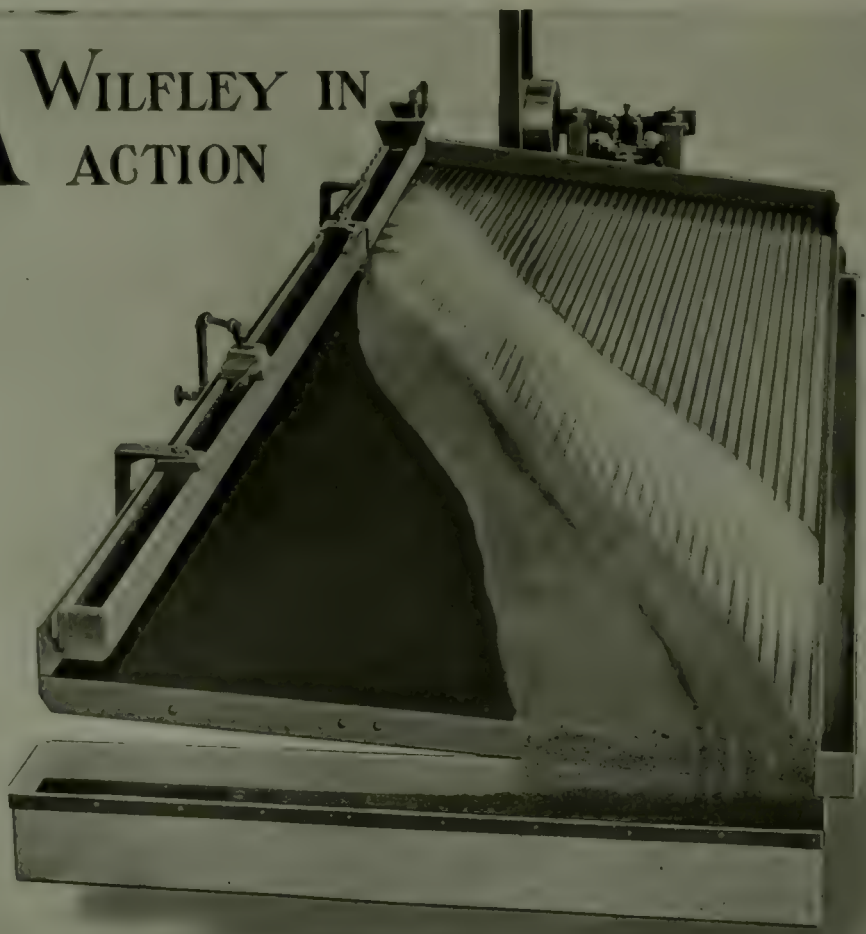
A WILFLEY IN ACTION



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EDITORIAL

IN estimating the importance of the recent troubles in Mexico it is well to keep in mind that there are those who believe their political ambitions would be served by discrediting President Diaz. One of the most effective ways of bringing this about would be to involve his administration in foreign difficulties. It is significant that what began as a peaceful and proper protest on the part of students, became an outbreak on the part of a rabble.

CONSERVATION is discussed in this issue by Mr. C. W. Hayes, who, as chief geologist of the United States Geological Survey, has had unusual opportunities to study the problem of conserving our natural resources. In his address, originally delivered at the University of Chicago and presented here in a slightly condensed form, Mr. Hayes has treated the matter in a notably sane and informing manner. Such discussion is helpful, and we especially commend the article to our readers.

THE TENNESSEE COPPER COMPANY has an excellent reputation for pioneer work in developing mining and metallurgical methods. While the ore that is handled is low in copper content, the company is fortunate in that the mine is situated where it is possible to sell the sulphuric acid manufactured as a by-product. Making acid, however, out of the lean gas available has involved many difficulties which have been met with distinguished success. We print in this issue a general account of the work of the company, written by Mr. Karl R. Morgan, one of the younger American mining engineers, now in Mexico, but who had the opportunity of visiting and studying the work at Ducktown. That he used his opportunity well is evident.

THE MACHINE-DRILL competition lately completed at Johannesburg in the Transvaal has attracted little notice in this country. The local Chamber of Mines offered a money prize for the best drill, suitable for working in the comparatively narrow stopes of the Rand mines. This prize was afterward supplemented by the Government, and the total money offered amounted to £5000. The conditions were severe, but there were 23 entries, including a number of drills of American make. After the elimination trials the number competing was reduced to 10. Only 4 drills completed the allotted tasks, none of them being American, and it would be interesting to know from our countrymen why they did not continue. It seems strange that manufacturers who were the pioneers in this field of industry played such a small part in this important contest. In numerous

contests held in the United States and in actual work. American drills have established enviable records.

TENABO is the name of an old mine in Lander county, Nevada, that in years gone by was a heavy producer, but which has long been idle. Recently the Tenabo Mining & Smelting Company was organized to reopen the property and a disastrous attempt was made to sell its stock on the New York Curb. Now it is announced that an effort will be made to interest French capital. This is not likely to succeed, but it will make it more difficult than ever to enlist French support for the really good American enterprises. Reopening old mines and developing new ones are legitimate undertakings and greatly to be encouraged, but such work involves an element of risk that is foreign to the ways of French investors, and, since of any number of such enterprises a large proportion prove failures, it induces a general skepticism as to American securities among those who might otherwise be heavy investors. Manhattan Consolidated, Utah Copper, United States Steel Common, to cite but three American stocks recently sold in France, are conspicuous examples of stocks of speculative value. At least one of these was sold under what amounted to misrepresentation. Since American mining enterprises need additional capital and the French with much to invest are willing to accept a low rate of interest, it is a pity that they are offered the speculative rather than the assured stocks. The inevitable result is to spoil a good market.

California Mining Bureau

The excellent report upon 'Gold Dredging in California,' written by Mr. W. B. Winston and Mr. Charles Janin, calls sharp attention to the possibilities of usefulness inherent in the State Mining Bureau supported by California. As is well known among mining engineers, the Bureau, under its present chief, has been for several years a singularly useless, not to say harmful institution. That it has now published a valuable report on one of the most important industries of the State is due less to the gentleman whose name appears conspicuously on the cover than to the authors whose names are printed in modest type inside the work itself. The dredging companies have most generously given full data both as to costs and technical performance, but the main credit for the work must go to Mr. Winston and Mr. Janin. It is but fair that their fellow engineers should know that one of the gentlemen received nothing for his services, and the other only the most modest compensation. The work has been carried out with fine professional spirit as something of benefit to the industry, but it is hardly appropriate that a rich State such as California should accept gratuitous professional services when efficient management of its departments would make this unnecessary. Closer attention to printing bills, to efficiency in the work of regular employees, would work marvels of economy. The Governor-elect, Mr. Hiram Johnson, has given solemn pledges to clean up the State government. He starts in unhampered and with the enthusiastic support of a great people. We hope he may enjoy every success, and, incidentally, we invite his attention to the conduct of the State Mining Bureau under the administration of the present State Mineralogist. Here is something which touches directly the first great industry of the State, the one that gave it being and one that makes annually an enormous contribution to the wealth of the State and Nation. The position of State Mineralogist should be filled by a competent technical man who has the confidence of his professional associates. It should no longer be treated as one of the spoils of politics. Do the work right or abolish the office.

Mexico and the United States

Accounts of the recent rioting in Mexico have been read with particular interest by mining men. A large portion of the Americans living in Mexico are connected with mines, and American investments in mines and smelters are especially important. To our professional brethren in the Republic of Mexico we extend every sympathy in these trying times. It is hard that they should suffer because of the reckless and cruel act of a Texas mob. It is, however, a law of life that cruelty begets cruelty, and punishment falls often on the innocent. It is a time for great patience and restraint on both sides of the line. Fortunately the disgraceful excesses in the City of Mexico and in Guadalajara, as well as in Texas and Oklahoma, are but the expression of an unthinking minority. Between the American and Mexican peoples there has long been the greatest mutual respect and good-will. The officials of the two governments are doing everything possible to allay apprehension and to preserve these cordial relations, fortunately with every prospect of success. It is striking that, despite the natural antagonism that seems always latent when two races are brought together, despite the fact that the majority of the Mexicans in the United States are poor men occupying subordinate positions while most of the Americans in Mexico go as investors or representatives of investors, and so in their daily work give orders to numerous Mexicans in their own country, despite certain historical clashes, there has been so little friction between Mexico and the United States. It is scarcely less striking that with all the lurid accounts of the riot that have been sent broadcast, there is no talk of reprisals or of war. This is due to the long continued and intelligent efforts of the officials of the two countries, and especially of those of Mexico. It is also due to the fact which thinking Americans must recognize, that in this affair we are deeply in the wrong. It is expected that the Mexican Government will effectively protect the Americans in Mexico, and it is believed that it will do so, but in the United States the national government is practically powerless to protect Mexicans or any others, including its own citizens, against mob violence. Preservation of the peace is a function of the State and local governments, and when local public opinion in any district condones the act of a mob, as it often does, there is small chance of bringing any one to justice. By quick and determined action a sheriff can nearly always save a threatened prisoner, but the sad fact is

that in districts where mob violence reigns the sheriff is usually in sympathy with the mob. It is difficult to see any prompt and effectual remedy. Education and the slow growth of a sound public opinion will eventually cure the evil as it has in older countries. In the meantime foreigners living in the United States but take the risk that its own citizens must face. Inasmuch however as our Government exacts from other countries scrupulous protection of Americans it is right and proper that similar protection be given in America to foreigners even if we do not care for it ourselves. Fortunately there is ample constitutional authority for doing so. The constitution makes treaties part of the supreme law of the land, and the late president, Benjamin Harrison, himself a recognized expert in the law, recommended that Congress enact such legislation as would place in the hands of the Federal Courts the enforcement of treaty obligations. That this would effectually cure the evil is believed by nearly every intelligent student of the subject. It is well recognized that a man or a community that will take violent liberties with laws that must be enforced by local judges and by peace officers elected from the community itself, will be scrupulous in observing the Federal law and regulations. It is not severity but certainty of punishment that makes for law enforcement, and the Federal courts have an enviable record in the matter of dealing with crime and criminals. The law recommended by Mr. Harrison has been repeatedly introduced in Congress, but has never been seriously considered. It ought to be promptly passed.

What is Coal?

It has long been customary to rate coals upon the basis of a proximate analysis, including determination of the percentage of moisture, ash, fixed carbon, and volatile 'matter' or 'combustible.' If to this, determinations of the sulphur and the number of heat units were added, it was felt that all the information the most exacting engineer could ask, had been furnished. This method of analysis had the virtue of simplicity, the determinations were easily and cheaply made, under standardized methods fairly concordant results were possible, and the information furnished really was adequate to many of the needs of the engineer. Fortunately, or unfortunately, according to the point of view, there are always inquisitive chemists, and some of these refused to accept such simple analyses as sufficient. Engineers found, too, that the proximate analyses in many cases failed to give the data upon which coal could be properly rated, and even at times led to the rejection of coal found on trial to be excellently suited to some particular use. The modern campaign against smoke, the desire for greater efficiency in burning, the development of the gas-producer and the gas-engine, have all co-operated to stimulate the search for better methods of coal analysis. The ultimate analysis, in the course of which carbon, hydrogen, nitrogen, sulphur, and other elements are determined and the residue set down as oxygen, failed to satisfy this want. It was quickly found that not only the elements in the coal, but their form of combination must be known in order to use an analysis to determine its value for a special purpose. When chemists were asked just what coal is, they were unable to answer, but professed entire willingness to attempt to find out. Many men went to work on the problem, particularly in the United States, Mr. N. W. Lord at Ohio State University and Mr. S. W. Parr at the University of Illinois. It was Mr. Parr who showed that the volatile matter in coal was by no means all combustible, but that some of it was not only inert but anti-calorific. Gradually the conception of coal as a solid solution of hydrocarbons, roughly comparable to the liquid solution represented by petroleum, came to be developed. German chemists were first to attempt analysis of coal by dissolving out successively the different hydrocarbons, a method that while yet imperfectly developed shows distinct promise. Both in Germany and in the United States research was undertaken along the line of destructive distillation at low temperatures, and results were obtained that have been of great interest, particularly to gas manufacturers, and may prove to have important bearing on the problem of coking dry coals. The work of the United States Geological Survey, beginning with the coal-testing plant at St. Louis and continuing with the organization of the Technologic Division, now become the United States Bureau of Mines, greatly stimulated these researches on coals. The Engineering Experiment Station and co-operating departments at the University of Illinois formed a second centre of research. Mr. Lord for the Government, Mr. Parr for the State, with their numerous and active assistants, have in a short time developed a fairly enormous amount of new data on coal. It is appropriate that the first bulletin of the Bureau of Mines should have for its subject 'The Volatile Matter of Coal' and should treat the subject in a scholarly and scientific manner that augurs well for the character of the succeeding bulletins of the series. The authors, Messrs. Horace C. Porter and F. K. Ovitz, were trained under Mr. Parr and worked under Mr. Lord, and they have accordingly had the benefit of criticism from both men. They confirm the conclusion of Mr. Parr that a considerable portion of inert material exists in the volatile products of coal and show that the amount and composition are specific characteristics of each type of coal. They find that there are comparatively large percentages of carbon dioxide, water, and other inert materials in certain Western coals; that large amounts of the higher methane hydrocarbons are distilled at moderate temperatures, particularly from Appalachian coals; that the younger Western coals yield, at moderate temperatures, quantities of gas and tarry vapors. These facts have direct bearing on the smoke-producing tendencies and the adaptabilities of the various coals. The studies also afford much data for further scientific research, though they do not as yet permit an exact definition of coal itself. They furnish a basis for intelligent experimental work with furnaces, gas-producers, and coke ovens, that is sure to yield important economic results.

The Conservation Movement

By C. W. Hayes

Any attempt to evaluate contemporary events and personages is an extra hazardous undertaking. Events, however, have been moving so rapidly in the past few years that it may be possible to obtain a reasonably correct perspective, to reduce them to their proper proportions. Few subjects have occupied a larger share of public attention during the past three or four years than the subject of conservation. However much the term may have been overworked, and whatever extravagances may have been committed in its name, it is a most significant and encouraging fact that the American people are awakening to the urgent necessity of systematic action. This promises a saner and more permanent industrial development. In its popular aspect the conservation movement began with the calling of the first Conservation Congress in 1907, but it will be easily understood that its real beginning must be sought much farther back than this. There was a long period during which a gradually increasing number of thinking men were recognizing more and more clearly the extravagance attending the use of natural resources, and were collecting information as to the extent and value of these resources. These ideas began to assume definite form and to find occasional expression near the middle of the last century. They grew steadily with the rapid growth in industrialism and the consequent increasing demand for raw materials, with the change from small units of production widely distributed to a few large units highly concentrated. Among the many agencies which brought the country into a condition of preparedness for the movement a few may be mentioned.

1. The earliest of our natural resources to be seriously depleted was timber, chiefly because of habits inherited from generations of pioneers to whom the forest was simply an obstacle to be overcome and destroyed. It was natural, therefore, that the Forest Service from its beginning should have consistently and actively urged the importance of conservation, chiefly of the forests, but of other resources as well. The passage of the law in 1901 providing for forest reserves, was due largely to the influence of the Forest Service, and gave practical and concrete effect to its efforts. The results of the investigations and of the educational campaign carried on by the Forest Service have extended to privately owned forests, and many large lumbermen have abandoned the wasteful methods which were formerly universal.

2. With the rapid filling up of the agricultural lands in the West the necessity for utilizing and so conserving the waters of the arid regions became pressing. The possibilities of irrigation, first clearly and forcibly pointed out by J. W. Powell in 1878, were realized through the enactment of the reclamation law in 1902. Thus a second great agency for the cultivation and dissemination of conservation ideas was developed in the Reclamation Service.

3. While mechanical engineers during the nineteenth century had brought the steam engine from an extremely crude and lowly beginning to a high state of efficiency, the question of increasing the power obtained from every pound of fuel used had received relatively little attention. Highly important, therefore, was the series of investigations inaugurated by the Geological Survey at the fuel-testing plant in connection with the St. Louis Exposition. The Technologic Branch of the Survey under which this work has been carried on, and which is now the Bureau of Mines, has been another effective agency for preparing the way for conservation ideas.

4. The organic law of the U. S. Geological Survey enacted in 1879, specifies as one of the duties of that bureau the "classification of the public lands." For reasons which need not be given here this eminently wise provision of the law was 'more honored in the breach than in the observance' until 1905, when work was started in southwestern Wyoming for the specific purpose of classifying the land. This work was so fruitful of results that it was greatly expanded the following year. Largely through the experience thus gained and the recommendations based on this experience, the policy of withdrawing coal land from entry pending classification and valuation was adopted. The officers of the Survey believed that the authority to withdraw coal lands from entry pending classification and valuation was necessarily implied in the existing coal-land law, but they also believed that this executive authority should be employed conservatively and only for the express purpose stated in the withdrawal; that it should not be employed to accomplish other objects, however desirable in themselves those other objects might be. In this the Survey was temporarily overruled, and large areas of land were included in the 1906 withdrawals for which there was never the slightest justification. However, in spite of mistakes due rather to excess of zeal than to any bad motive, the policy of land withdrawals has been both a powerful agency for educating the public and an effective means for accomplishing practical conservation. Applied at first only to coal lands it has subsequently extended to oil and phosphate lands and to water-power sites, and through the recently enacted legislation the question of the legality of the withdrawals is entirely removed.

By means of these agencies and many others less prominent, but none the less effective, public opinion was educated to the point where only the dramatic touch was needed to make conservation a popular national movement. This touch was the President's call for the famous White House conference in 1907. The meeting of thirty-four State governors and many distinguished scientists to discuss the conservation of our natural resources, was sufficient to attract and fix public attention as nothing else could possibly have done. The first conference dealt largely in glittering generalities, but it made possible the one in 1908, at which a great mass of facts bearing on the subject was presented by the best qualified experts in the country.

The second period in the movement was brief and

dramatic. It extended from 1906 to 1908, covering the two Washington conferences. It was the time of popular awakening to facts and conditions long familiar to a few, but coming to the mass of the people as something entirely new. This period was characterized by more or less sensationalism and hysteria. Much truth was disseminated, but along with it was much misinformation and many half truths. It accomplished the extremely important result of fixing public attention, but it was merely a temporary and passing phase of the movement.

The third period is just being entered. It has been characterized thus far chiefly by unfortunate recrimination and denunciation. Like most other articles of faith, conservation means many widely diverse things to different men. A clear definition of the term, a formulation of creed, is therefore a necessary preliminary to the discussion. Disregarding the views of the extremists and visionaries we may define conservation as **utilization with a maximum efficiency and a minimum waste**. Please note that I lay special stress upon **utilization**, for I regard it as an essential feature of any form of practicable conservation. To conserve resources for future generations at a serious sacrifice of the interests of the present is not only unwise, but is wholly impracticable and visionary. To be effective, therefore, conservation measures must rest upon an economic basis; to secure the adherence of an interested party they must appeal to his business sense as offering distinct material advantage. Thus the arguments for conservative forest management of privately owned forests were absolutely without effect until it was demonstrated that such management offered larger profits than the practice in use. Likewise it is useless to urge a coal operator to mine out all the coal in a bed if by so doing he runs his mine at a loss. Only the inducement of economic advantage, of increased profits, will be generally effective.

There appears to be an unfortunate confusion in the minds of certain advocates of conservation. They have apparently confused conservation of natural resources with destruction of the trusts, and the mixture has resulted in pure demagoguery. Unquestionably both subjects are highly important, but they have no necessary connection, unless indeed they are antagonistic. The natural resources will not be conserved by destroying the trusts, nor will the trusts be controlled by checking the waste of natural resources. Anyone who has studied conditions attending the development of mineral deposits must have been impressed by the fact that those deposits held by large companies are being developed and utilized with a view to prevention of waste, in accordance with the principles of conservation, to a much greater extent than are the deposits held by small companies or by individuals. The explanation is purely economic. The large company can introduce at a profit methods for preventing waste which would be ruinously expensive to the small operator, and furthermore the soulless trust is immortal and must provide for its continued existence far beyond the ordinary lifetime of the individual. Hence the logical conservator of our natural resources is the trust. I am aware that this is rank heresy in certain quarters and that my statement is liable to be misunderstood and distorted, but the sooner we recognize clearly the antagonism between conservation and destruction of the trusts the sooner we shall be in a position to solve the problem wisely and fairly.

It is obvious that the term 'natural resources' covers a wide field and that from the viewpoint of conservation they admit of classification into a number of widely separated groups. The type of the first group is water-power which is conserved only by utilization, and is best conserved when it is most fully developed and used. In this group are wind-power and the radiant energy of the sun. Since water-power cannot be conserved by hoarding, its early and complete utilization in the most efficient manner possible is clearly the end to be sought. The second group includes forests and soils which are renewed under favorable conditions, though slowly, and to yield the largest benefits must be used continuously, but are liable to serious depreciation and waste through improper use. Here the problem is obviously to balance the use against the renewal so that the resources suffer no permanent depreciation. The third group includes minerals which once used are never renewed, but are gone forever. A further subdivision of the useful minerals is necessary into two classes, inexhaustible and exhaustible. Of these the first includes those minerals which occur in nature so abundantly and so widely distributed that no conceivable use will materially diminish the visible supply; such are salt, limestone, clay, sand, building stone, and in general minerals used as structural materials. The second class, the exhaustible minerals, includes those which, although in many cases they occur in very large quantities, nevertheless are definitely limited in distribution and amount; such as the fuels—gas, oil, coal, and lignite; the metalliferous ores, sulphur, and phosphate.

It is this latter class, exhaustible minerals, with which the problems of conservation are chiefly concerned. Here it is necessary to weigh present demands against future needs, and to devise methods of utilization which shall neither sacrifice the interests of the present nor entail unnecessary hardship on future generations. This can be accomplished in general, by utilizing the minerals (1) for the purpose for which they are most valuable, (2) in the manner that will secure the most efficient results, and (3) in the locality where the greatest economies can be effected.

Let me illustrate by a concrete example. Natural gas is the ideal fuel and source of power, but by reason of its unstable and fugitive nature is the mineral most likely to be seriously wasted and first exhausted.

In this connection the history of natural-gas development in the United States is instructive. Its discovery has in every case been incidental to the search for oil, and it has always been at first regarded as an unmitigated nuisance by the oil driller. For many years in the exploitation of the great Appalachian oilfields in Pennsylvania and West Virginia it was permitted to go to waste until its enor-

mous industrial value was discovered. Now, however, an intricate system of pipes reaches out over this region, and from every well that will yield an appreciable amount, the gas is pumped and turned into the great arteries which furnish a supply of fuel and power to the manifold industrial establishments of western Pennsylvania and eastern Ohio. Moreover, additional supplies are being sought through the drilling of new wells, and the search for gas is as eager as it has ever been for oil. This notable change has been brought about in part by legislation, but chiefly by intelligent co-operation between the large gas companies and the oil producers induced by the decreasing quantity and increasing value of the gas. In 1885-6 the great gasfields of Ohio and Indiana were discovered and the same disgraceful history was repeated: First there was unchecked waste, then extravagant use with the belief that the supply was inexhaustible; finally came the recognition of the unwelcome fact that the supply was strictly limited, and with it economical utilization and development under wise legal regulations. A few years later the Kansas-Oklahoma fields were discovered, and there the same history was in a measure repeated, although the value of the gas was more promptly appreciated and the industrial development was correspondingly more rapid. In all of these fields except Oklahoma, the maximum yield has probably been passed, but the industries that were established by reason of the exceptional inducements offered by the abundant supply of cheap fuel and power, remain as permanent sources of wealth to the communities which were sufficiently energetic to take advantage of their opportunities.

The industrial possibilities afforded by the great supplies of the most perfect fuel and source of power in nature tax the imagination, but the realization of these possibilities depends on the application of the fundamental conservation principles stated above. The gas must be utilized (1) for the purpose for which it is most valuable, (2) in the manner that will secure the greatest efficiency, and (3) as near as possible to the point of production.

1. The most valuable use for natural gas is in the development of power. It is estimated that with gas at 12c. per thousand, electric-power can be developed as cheaply as it can be generated by water-power at Niagara. But a quarter of this price or 3c. per thousand would be a highly remunerative price for the gas in northern Louisiana. It follows therefore that electric-power can be generated in this region at one-fourth the cost at Niagara.

2. Experiment has shown that the amount of gas required per hour for the development of one horsepower varies from 9 cu. ft. with the highest type of large internal combustion engine to 130 cu. ft. with the ordinary steam engine. In other words, the efficiency of the gas is over fourteen times as great when used in gas-engines as when used for generating steam under the boiler. This leaves no possible question as to the manner in which the gas should be chiefly utilized.

3. The methods of transporting natural gas through pipe-lines and the long-distance transmission of electric-power have been brought to a high state of efficiency in the past ten or fifteen years, but they still involve an expensive plant which must be paid for and maintained by the consumer. Thus if the gas were piped from northern Louisiana to St. Louis it would probably require the expenditure of four to eight units of the gas to deliver one unit to the consumer. In other words, if used in St. Louis the efficiency of a given production would be between one-fifth and one-tenth as great as if used at the point of production. To utilize the power which the gas now escaping in Louisiana is capable of generating would, of course, necessitate the development of great industries where none now exist. But there are no physical reasons why they should not be developed, since the necessary raw materials are close at hand. These raw materials are the coal, sulphur, salt, limestone, clay, sand, and gypsum and the ores of aluminum, manganese, and iron, which with a cheap source of power, are the essentials of the principal chemical and metallurgical industries. Some of these raw materials, as the sulphur, salt, and bauxite, are now being mined and transported to distant points where cheap power is available, as at Niagara Falls, and in the natural-gas fields of Kansas, Indiana, and Pennsylvania. Thus the utilization of the natural gas near its point of origin would not only greatly increase the efficiency of the gas, but would effect equally great increase in efficiency in the utilization of many other mineral resources. The point which I wish to impress is that the increase in cost of raw materials due to unnecessary transportation to distant points of manufacture is just as much a waste of the raw materials as though a certain portion of every ton mined were dumped into the sea. It is even worse than that, for in many cases the unnecessary transportation is expended on inexhaustible minerals, such as limestone, clay, and salt, but it is at the expense of an exhaustible mineral—coal.

The principle that all substances shall be used for the purposes for which they are most valuable involves the substitution of the more abundant or inexhaustible for the less abundant or exhaustible, subject always to the factor of location. Examples of practical conservation effected by this means are the substitution of water-power for steam, of cement for wood and iron in construction, of peat and lignite for development of power by means of the gas-producer and gas-engines in place of high-grade coal under the boiler, of producer-gas from lignite in place of coke from high-grade coal for metallurgical operations, and many others might be cited.

The second half of conservation as before defined, is utilization with minimum waste, and in the case of mineral resources there are preventable wastes in extraction, in preparing for use, and in transportation. The extent of the waste from these sources and the extent to which it is preventable vary widely in case of different minerals, and the means that must be employed for preventing the waste are correspondingly varied. The greatest percentage of waste is in connection with the development of natural-gas fields, and it is probably safe to say that taking all of the fields together, much more gas has

been wasted than has been actually consumed probably many times as much. From this extreme the percentage of waste decreases practically to zero in case of some of the metallic ores having high unit values. In the case of coal it is usually counted that for every ton mined half a ton remains in the ground in such shape that it can never be recovered. With coal there is an added waste in preparing for market, as is evidenced by the enormous accumulations of slack and culm at modern coal mines. In general there are two ways in which this waste may be prevented or reduced, first by the exercise of the police power of the State, and second by the development of industrial conditions which shall make it profitable to reduce the waste. The field within which legal remedies for prevention of waste are applicable is very restricted, practically to those cases in which the acts of one individual may seriously injure the property of his neighbor, that is, to the development of oil and gasfields. For example, if I own a forty acre tract of coal land, it is little, if any, concern to my neighbor or the public generally what I do with it, whether I choose to leave the coal in the ground or to mine it economically or wastefully. If, on the other hand, I own forty acres in a gasfield, the case is entirely different. I may drill a well of which I lose control through carelessness or ignorance so that it not only destroys my own property, but also that of my neighbors. In an oilfield a careless driller may admit water into the oil-bearing stratum from above or below, and greatly damage the productiveness of a large area. Thus the entire community may be injured through the acts of a single individual. His acts then become a matter of public concern and a proper field for legislative control. This has been generally recognized and nearly all States having important oil and gas resources either have already enacted laws regulating their development or have such legislation under consideration.

Legal remedies for the prevention of waste are, however, at best only to be regarded as emergency measures, useful at first to control the situation until the necessary public opinion can be developed and afterward for the control of the small percentage of operators who are too selfish or shortsighted to heed public opinion. The real and permanently effective control must come through the operation of economic rather than statutory laws, through the development of local industries in a gasfield, for example, which shall make the gas so valuable that no operator can afford to waste it and no community can afford to permit waste to continue. In the development of the more bulky minerals such as coal, iron ore, bauxite, or phosphate, waste is due chiefly to two causes, first, unrestricted competition, and second, distance from point of production to point of utilization. The coal operators in the Pittsburg district recognize that the coal in that district is limited in amount and that at the present rate of production it will be exhausted at no distant date. They recognize that present mining methods are extremely wasteful, only the best grade of coal being mined and half a ton of that being left in the ground for every ton taken out. But they also recognize the fact even more clearly that under present conditions of keen competition and narrow margin of profit no other method of mining is possible except at a loss. If all of these operators could combine and increase the price of coal a few cents on the ton and at the same time market a slightly lower grade fuel, they would be able to reduce the waste to insignificant proportions, a result which certainly a large proportion of the operators are anxious to secure, since it means longer life to their mines and greater aggregate returns on their investment. In this connection one point must be emphasized which is wholly ignored by many of the most ardent advocates of conservation. It is that conservation of our natural resources means immediate higher cost of raw materials and consequently of finished products to the consumer. Whether prevention of waste is secured by legislation, by public opinion, or by combination and elimination of competition the consumer must pay for it. This increased cost due to the prevention of waste should eventually be offset by economies due to more efficient utilization, but this effect will not be immediately apparent. As illustrating the second source of waste, distance from point of production to point of utilization, take bauxite and phosphate, both of which are among the exhaustible mineral resources. The mineral bauxite forms the basis of three important industries, namely the manufacture of metallic aluminum, of alum, and of alundum, or artificial corundum. It has thus far been discovered in commercial quantities in this country only in the Southern States—Georgia, Alabama, and Arkansas. Since the mining of bauxite began in 1889 about 600,000 tons of the mineral have been produced, and every ton has been shipped to points in the vicinity of Chicago, Pittsburg, and Niagara Falls. The manufacturers at these points demand a certain grade of ore, since the lower grades will not bear the cost of transportation. Thus the silica must run below 10%, since silica, while not otherwise injurious, is so much dead weight on which freight must be paid. But a large proportion of the ore in most of the deposits contains more than the allowable percentage of silica. These portions of the deposits are therefore not marketable under present conditions, and are left in the mine or thrown on the dump and lost. If the manufacturing plant were located near the mines this low-grade ore could be utilized and the average cost of mining greatly cheapened. By passing it through the first process of manufacture a ton of ore having a value at the mine of about $4 is converted into products weighing only a fraction of a ton, but having a value of from $50 to $175; and these products easily bear the transportation charges to distant points of consumption. Phosphate, like bauxite, has thus far been produced in commercial quantities only in the Southern States, and by reason of cost of transportation the manufacturers of fertilizers have insisted upon a grade of rock containing not less than 65 or 70% lime phosphate. But the Tennessee deposits contain a large proportion of 40 or 50% rock, and in most cases this is wasted in mining the marketable material. At the present

increasing rate of consumption there is no question that within a comparatively few years these deposits will be so far depleted that rock containing as low as 40% lime phosphate will be in demand.

I have shown that mineral deposits cannot be generally utilized with the highest efficiency by the small owner, or held in reserve for the future so effectively as by the large owner—in other words, by the trust. Following the same line of reasoning, it is evident that the Government can still more effectively provide for future needs by a wise conservation policy applied to the administration of the mineral resources remaining in public ownership. I should by no means advocate a policy of hoarding these resources regardless of present needs. The Government still retains the title to about 60% of the coal land in the Western public-land States. It can afford to capitalize the value of this land at a lower rate of interest than any individual or trust and therefore the consumer of coal a hundred years hence will get cheaper coal if the Government retains ownership than if it passes into private hands, even if the private holder realizes only a fair and reasonable return on his investment. The policy of the Government in relation to its coal lands should be, therefore, to sell these lands at a price sufficiently low to permit development in response to present demands, but so high as to discourage speculative buying for the future. Fortunately, it is now possible to carry out this policy since a law enacted at the last session of Congress permits the separate disposal of surface and mineral rights. Coal deposits can be held by the Government until they are actually needed for mining, while the title to the surface may be disposed of at once for purposes of agriculture and grazing.

The Government also retains the ownership in large areas of valuable oil, gas, and phosphate lands. The conditions with reference to these lands is much less satisfactory than in the case of the coal, for while they are withdrawn from all disposal pending classification, this classification and valuation will accomplish little good unless the law for their disposal is revised. Oil lands are now disposed of under the placer law which is absurdly inadequate to protect either the interests of the Government or of the oil man. In case of the phosphate lands no man knows whether the lode or placer law applies and practically all claims entered previous to the present withdrawal have rival claimants, each doing assessment work and each hoping to secure a patent. The one thing certain in the case is that it is due to yield a prolific crop of litigation. For both oil and phosphate lands a system of leasing is strongly urged. In the case of oil the argument for such a system rests on the unstable and migratory character of the oil by reason of which it cannot be sold like coal in terms of acres, but must be sold as a commodity and only after it reaches the surface where exclusive title to the product is first acquired. The argument for a leasing system applied to the phosphate deposits rests on wholly different grounds, but is equally strong—it is the necessity for regulating the development of these deposits so as to prevent the export of the product on which the future agriculture of the country directly depends.

I have endeavored to outline briefly the trend and status of the conservation movement, to define the conservation problem, and to indicate some of the means through which the desired results must be attained. The problem is an exceedingly complicated one at best and admits of no simple solution. Its solution will certainly not be promoted by throwing it into the political arena or by using it to advance the political fortunes of any individual or party. In its last analysis it is a problem of education. Its solution is dependent upon the dissemination of sound information, the cultivation of logical thinking, the development of sane action. It is not enough that the engineers, scientists, and college professors should be fully informed and alive to the necessities of the situation. The great mass of professional, business, and laboring men and women must be brought to realize that each one has a vital interest in the subject, that so long as our natural resources are not utilized in the most efficient manner possible each one is suffering a direct loss in his material prosperity and opportunities. An excellent start has been made, but much remains to be done. The greatest obstacle to the conservation movement is ignorance, and it must be overcome by a serious systematic campaign of education.

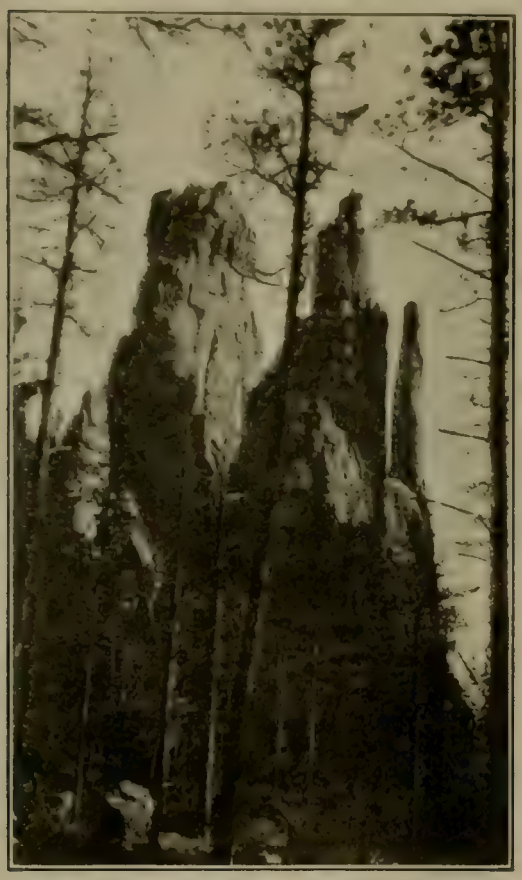
The first cyanide mill in the Black Hills was built at Deadwood in 1892, and it at once became apparent that, whatever might be accomplished by barrel-chlorination, the cyanide process was peculiarly adapted to the treatment of these ores which had so long defied the best metallurgists of the country. Other cyanide mills were built and in every case proved a success, although adopting different methods. Some crush dry, others wet, and still others in cyanide solution, but all operate successfully, and as a result the silicious ores of the Black Hills have produced to date not less than $30,000,000, and there still remain large bodies of ore untouched, aside from the probability of finding much that is unknown, for the area in which these silicious ores occur is large and in some portions developed or prospected to only a limited extent, particularly in the region on the north side of Custer peak, and extending northwesterly around the south side of Terry peak, to and beyond the canyon of the Little Spearfish.

The quarries of Maine supply immense quantities of stone, especially granite, for use in all parts of the country, but the ores of the State are not now extensively mined. For many years the ores of Mount Katahdin yielded 2000 to 15,000 tons of iron per year, and in the early sixties the Lubec and other lead mines were worked in a small way. In the eighties several hundred tons of copper was smelted at Bluehill from ores mined at the Douglas and other mines in the neighborhood. In addition to this metallic output, about 5000 oz. of silver has been mined at Sullivan and Byard Point. The total value of the metal product of Maine to date, except iron, is probably about $400,000.

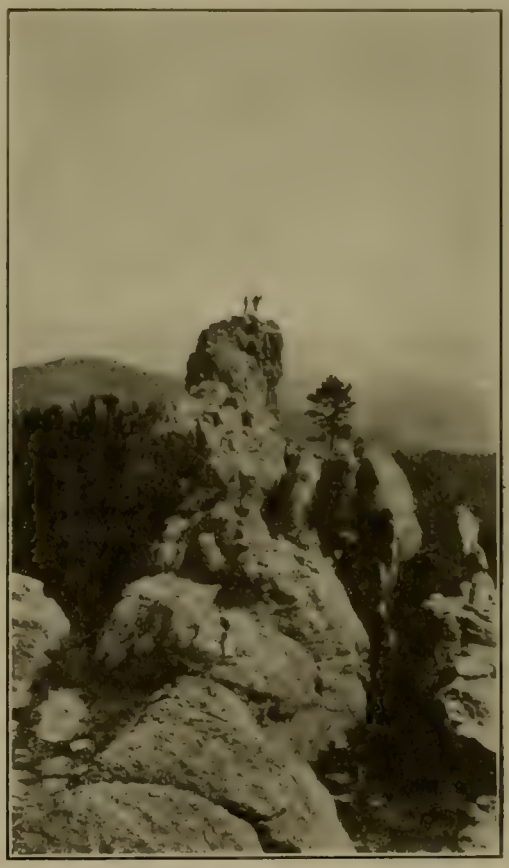
The Black Hills of South Dakota—VI

By William H. Storms

Besides gold the Algonkian rocks in the Black Hills contain ores of copper, silver, lead and antimony. Lead at several localities, large masses of pyrite. In addition to these the granite dikes both of the Harney Peak region, and in the Nigger Hill district contain tin, and in the former locality mica, wolframite and spodumene in commercial quantity. Copper is found in a number of localities that have been sufficiently developed, and is known to occur also



In the Central Black Hills.



Summit of Harney Peak.

where little work has been done. Among the latter are the Blue Lead, near Sheridan, in Pennington county; an occurrence on the upper south fork of Rapid creek, 8 miles above Rochford; on the summit of a high hill, a mile north of Reynolds' ranch, near the south fork of Castle creek; at Hat Mountain, 2 miles south of Deerfield; at several places near the head of the north and middle forks of Box Elder creek, southeast of Bulldog ranch; on City creek, and on Deadwood gulch, near Deadwood; and in a few other localities of less importance. In each of these instances the copper occurs chiefly as malachite, azurite, and black oxide, in graphitic schists. These are the oxidation products of cupriferous pyrite in the schists and adjacent rocks. At several points

condido mine near Galena. Galena was occasionally found in quartz on the north side of Deadwood gulch, opposite the Father de Smet mine, in 1878, where it was associated with visible gold. A small amount of galena was also found in the Uncle Sam mine (now the Clover Leaf), on Elk creek. On Whitewood, near Pluma, a thin seam of brittle-silver ore was discovered in early days, in what was known as the Beard mine, but the find was developed to only a limited extent. Antimony sulphide (stibnite) containing both silver and gold, occurs at Silver City, on Rapid creek, where it is scattered through large lenses of quartz in the schist, which in this locality is extremely hard and impregnated with finely disseminated pyrite. In the early history of the prin-

cipal mine, the Diana, the owners drove an adit nearly 500 ft. across the hard, dense slates and schists to reach the vein which outcropped on the hill above. This procedure is not unusual, but in this instance had the miners gone around on the Rapid creek side they might have run directly in on the vein, and thus saved several months of hard work.

About Rochford, and in the region of the gold belt on Castle creek; at Keystone; also near Custer; in fact throughout the central Hills, auriferous mispickel is of common occurrence. Some of these ores are high grade, others are of nominal value, the range being from $4 or $5 to $3000 or over per ton of concentrated mispickel. Some of that on Laughing Water, near Custer, is of very high grade. Not all of these ores, however, are arsenical, for some of them are remarkably free and consist chiefly of quartz with disseminated gold, no sulphide mineral at all being present. Often the quartz is glassy and of a character that the prospector is prone to condemn at sight, but occasionally it is extremely rich in gold, and when a prospector is fortunate enough to run across rock of this character filled with gold it usually cures him of his prejudice.

The remarkable vein-like dikes and lenses of granite in the region of Harney peak are most interesting. The granite is of the pegmatite variety and generally of exceptionally coarse crystallization. Orthoclase, albite, and other feldspars, with white, bluish, and beautiful rose-colored quartz, make up the greater portion of the rock, but black tourmaline is also present, occurring in crystals from slender hexagonal needles to great three-sided prisms with curved and striated faces. This mineral is abundant in places and gives the rock mass a most striking appearance. In some of the granite masses both biotite and muscovite occur, the latter often in large 'books', as the crystals are called by the mica miners. A great deal of merchantable mica has been mined from these dikes, particularly in the vicinity of Custer. Besides the minerals mentioned, crystals of green beryl, a foot or more in length, are abundant in some localities, particularly southwest of Custer. Wolframite, columbite, and tantalite also occur in some places, while cassiterite and spodumene are found in commercial quantities. In addition to these there is present a variety of other minerals chiefly valuable to mineral collectors.

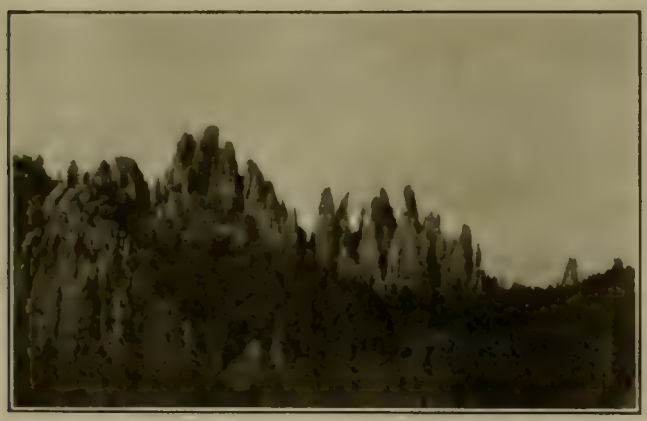
The Etta mine, near Keystone, is in the most remarkable of all these granitic instrusions. The orebody occurs in mica-schist in the form of an elipsoidal mass, with a rudely concentric structure. That is, the minerals are disposed in rings or layers. The intrusion is approximately 200 ft. long and 150 ft. wide. A mixture of huge blocks of bluish-white quartz and albite feldspar forms the centre of the mass. This is enclosed in an envelope of albite and mica, much of which forms the rock known as greisen. Cassiterite occurs in the greisen and also in the non-micaceous albite. Outside this is another layer of massive albite, throughout which are scattered crystals of spodumene of such huge proportions as to almost surpass belief. These are the largest crystals thus far discovered in the world. They are disposed in all directions in the albite matrix, suggesting to the miner the timbers in a caved stope. In size they range from 1 to 4 ft. in diameter, and are from 10 to 50 ft. in length. They are for the most part perfect hexagons. The albite surrounding these huge crystals contains cassiterite. Inclosing this wonderful layer of minerals is a zone composed largely of mixed muscovite and biotite. This layer contains little or no tin. The Etta mine is certainly a mineralogical treasure house. The line of demarcation between the granitic material and the mica-schist is sharply defined at this mine. In fact this is true at all of these granitic intrusions, no sign of contact metamorphism being observable. I have noticed near the Etta mine a coarse granite dike of large size in contact with a rather coarse sandstone of Algonkian age, in which little mica could be seen, and there was not the slightest sign of metamorphism such as might be expected under the conditions. In some of the granite dikes large vein-like masses of quartz occur and cassiterite is frequently seen inclosed in the solid mass of the quartz. Columbite also occasionally occurs in large masses—one weighing a ton was reported from the Bob Ingersoll mine several years ago. The tin stone occurs in most erratic manner. One instance came to my attention, near Hill City, where a fortunate miner had a splendid prospect in a hole about 10 ft. deep. He sold out for several thousand dollars. When the transfer was completed and the money paid over, he astonished the purchasers by advising them to sell out at an advance, if they could, but under no circumstances to attempt further development, at least not in that shaft. Upon being pressed for a reason, he gave it as his opinion that the vein would not 'go down.' They laughed at the idea and promptly put in another round of drill-holes and blasted the last of the tin-bearing rock out of the hole. A large amount of money has been expended in the development and equipment of the tin mines of the Black Hills, but up to the present time commercial success has not resulted from these operations, although the tin is in the rock and all agree that the metal is of superior quality.

Soon after the discovery of gold in Deadwood gulch, lead-silver ore was found on Bear Butte creek, in the upper Cambrian quartzite, and later in other strata, notably in the basal quartzite and in the intermediate arenaceous limestones of the Cambrian. Here a town was built, called Galena. The principal mines developed on these ores were the Sitting Bull, Richmond, Florence, Red Cloud, and the El Refugio. In the Cambrian formation between Deadwood and Galena, gold, silver, and lead ores occur at no less than five different geological horizons, all of which can be found on the divide east of Spruce gulch, where the most noted mines are the Belle Eldredge, Champion, and Lexington groups. In each of these the orebodies are associated with laccolithic sills or vertical dikes, and usually with both. Several mills, and at Galena a smelter, were built to treat these ores. In the aggregate the output from these mines is in excess of $1,000,000. In 1880 argentiferous lead-carbonate ore was found in the rugged region

east of the Spearfish canyon near the mouth of Squaw creek, but it was not until 1881 that these discoveries attracted much attention. Early in July of that year several rich finds were made and a stampede was started which in three weeks time resulted in building up a town of 3000 people called West Virginia City, but now known as Carbonate. Vigorous prospecting was carried on that year and hundreds of locations made of which the most important were the Iron Hill and some others in its vicinity about a mile south of the town, but it was not until 1885 when a mill and smelter were built that the district became prosperous. The Iron Hill mine was the principal producer and the output up to 1892 was nearly $700,000. The orebodies occurred in the Carboniferous limestones, though some ore, principally gold, was also found in the underlying Cambrian strata.

In the country around Terry peak, on Bald and Green mountains, and on various ridges of that region, and extending northward toward Carbonate and southward as far as Custer peak, is a mineral zone second only in importance to the auriferous belt in the vicinity of the famous Homestake. The ores of this mineral zone are valuable chiefly for the gold they produce, though silver also occurs. Sometimes it is in excess of the gold, as is the case at one shaft of the Portland group, where chloride of silver was found disseminated in a snow-white quartzite to the extent of 2000 oz. per ton. This was, of course, of limited occurrence. Throughout this region ores occur as a replacement in the basal quartzite of the Cambrian; in an impure limestone just above it, and in a second bed of limestone near the top of the Cambrian. Between these horizons are several others in which small amounts of ore have been found. Above all of these is another horizon marked by important ore occurrences, in the Carboniferous limestone, where is found surprisingly rich gold ore. The principal district in which the latter ore has been discovered is on the high limestone plateau near the butte known as Ragged Top, three miles northwest of Terry peak. The discovery was made in 1896 by prospectors who were not 'well posted', and who had the hardihood to have assays made of boulders of flint lying on the surface of the limestone, and which had been run over by scores of prospectors and scorned by them as not among the number. This flint was rich in gold was in fact shipping ore. News of the discovery started another stampede which quickly called three more new towns into existence—Preston, Balmoral and Ragged Top. The flint which constituted the ore in these mines consisted of silicified fragments of a brecciated limestone which had been crushed along the line of fractures in the rock. In 1881 flint was discovered in limestone in the Pocohontas mine on Squaw creek, which showed gold abundantly scattered through the rock and which was worth $4000 per ton.

The ores of the Cambrian formations were for the most part refractory and large fortunes were spent by the various mining companies before success was reached. The first attempts to treat the ores were by simple amalgamation, but it at once became evident that the ore could not be successfully treated in that manner, at least, not by the stamp-mill alone. The schools for experiment were the Portland and the Welcome mines, though some others made serious and expensive efforts in the same direction. At the Portland the 20-stamp mill was dismantled and pulverizers set up. These doing little if any better, and the expense being somewhat increased by their operation, the pulverizers were consigned to the dump and the stamps replaced. Then grinding pans were added, and by this means the extremely hard ore could be reduced to a fine pulp. A somewhat higher extraction was then obtained, but the cost was increased by the large amount of power required to operate the pans. About this time, 1884, a new type of pulverizer made its appearance. It consisted essentially of a double set of Cornish rolls operating within a cylindrical screen. The idea seemed feasible, but the rock was not broken fine enough for the pulverizer and it, too, was pronounced a failure. Had the ore been crushed with stamps and fed to the pulverizer better results would, no doubt, have been secured, but even if the ore had been reduced to a suitable fineness at not too great an expense, there would still have remained much to do before attaining a satisfactory solution of the metallurgical problem. In 1885-6, O. P. Ankeny built a mill at the Buxton mine, in Nevada gulch, in which he attempted to treat the telluride ores with bromine. He secured a good, or at least an encouraging, result, and there is little doubt that had he persisted in his experiments he would have been the first to successfully treat the ore. In 1890 the first chlorination plant was built at Deadwood, to treat the ore from the Cambrian formation—called locally 'silicious' ore. After running a short time the works burned, and a second and larger plant was built for the Golden Reward Co. This was a success. Barrel-chlorination was the process employed, and this mill, under the competent direction of several skilled metallurgists, did much to call attention to the great value and extent of the silicious ore deposits in the northern Black Hills.



Granite Needles Near Harney Peak.

Calculation of a Silver-Lead Blast-Furnace Charge

By James A. Barr

*Conditions.—Assume that it is desired to smelt as much dry silicious ore as is possible with only enough lead for a collector and that zinc sulphide is present in the lead ore to an extent which would lead to choice of a slag of the C type, which is especially adapted to working zincy ores and at the same time is as silicious as possible. It will be necessary to put enough roasted matte in the charge so that this product will not accumulate. Clippings, foul slag, etc., will have to be introduced after the plant is running regularly. The charge may be started with 50 lb. roasted matte, figuring the whole charge on the basis of 1000-lb. units for convenience. For the first, or starting charge the most favorable slag possible would be chosen so that the irregularities of starting may be more easily overcome. The analyses of ore, etc., are given on the accompanying charge sheet.

The next consideration is to get a safe amount of lead on the charge, assumed at 10%. This may be done by adding enough galena to furnish 100 lb. of lead or 167 lb. galena. Next, purely by guess and later by experience, 275 lb. silicious ore is put in as the probable amount required to make a charge of 1000 lb. The next step is to figure out the weights of the various constituents SiO_2, CaO, etc. The total weight of the SiO_2 from the galena, matte, and silicious ore, amounts to about 220 lb. This gives data enough to make the first estimate of the amounts of limestone and iron ore required.

Factors.—The Fe in the slag is $\frac{26.4}{34.0}$ or 0.78 times the silica. Knowing the pounds of silica going into the slag, the amount of iron required to go with it to make a slag of the given analysis, can be found by multiplying the weight of the silica in the charge by 0.78. $220 \times 0.78 = 172$ lb. Fe required or $172 \div 0.60 = 287$ lb. of iron ore since the latter only contains 60% iron. Since the matte will require iron and both the iron ore and limestone contain silica which is not included in the above amount of 220 lb., a slightly larger quantity of iron ore, 325 lb. must be taken.† $220 \times 0.5 = 110$ lb. CaO or $110 \div 0.54 = 200$ lb. of limestone or, allowing for the extra silica, about 225 lb. would be required. The analysis of the coke ash must be converted into terms of coke. The coke has 10% ash. The ash contains 75% silica; then the coke will contain 10% of the 75 or 7.5 silica. Complete finding the weights of the constituents and add up the total amounts.

All the iron is not available for the slags as some of it goes into the matte. The weight of the matte must first be computed from the amount of sulphur available. The slag contains 0.8% sulphur. Since the silica is 34% of the slag the weight will be $267 \div 0.34 = 785$ lb. and will contain 785 times $0.008 = 6$ lb. of sulphur. Then allowing for 20% volatilization 20% of $23 = 5$ lb. of sulphur may be calculated, making a total loss of 11 lb. and leaving, $23 - 11 = 12$ lb. of sulphur available for the matte. This amount will make $12 \div 0.20 = 60$ lb. matte containing 20% sulphur. To find the iron in the matte the copper must first be determined. Practically all the copper goes into the matte if sufficient sulphur has been provided. There is then 8 lb. of copper in 59.5 lb. of matte or $(8 \div 60) \times 100 = 13\%$ copper. Then the per cent of iron is $60 - 12.9 = 47.1\%$ Fe. The weight of the iron going into the matte will be 47% of 60 lb. or 28 lb. which must be subtracted from the total iron in the charge, leaving the iron available for the slag. If there were any arsenic present to form a speiss, 2.3 of its weight must be subtracted from the total iron. The next step is to see if the iron and calcium oxides are present in the right amounts to form the slag given. (Computation C.) According to the factors the Fe is 0.78 times SiO_2. There is 267 lb. of SiO_2 present, hence there should be 0.78 times $267 = 209$ lb. of iron present, but only 206 lb. is available, hence there is a deficiency of 3 lb. or in terms of iron ore, $3 \div 0.60 = 5$ lb. The charge will have to be corrected by adding this amount and if the error is very large all the computations will have to be gone over. According to the factor the CaO is 0.5 times the SiO_2, hence 267 times $0.5 = 134$ lb. CaO is needed. There is 139 lb. CaO on the charge which is an excess of 5 lb. CaO or $5 \div 0.50 = 10$ lb. of limestone which is added to the charge.

If desirable the approximate amount of base bullion may next be calculated, by subtracting the weight of the lead in the matte and slag from the total weight in the charge. This, of course, does not account for other metallurgical losses which are offset in a measure by the impurities entering the bullion. Lead in the matte may be determined as follows: 60 lb. of matte assaying 15% lead would contain 60 times $0.15 = 9$ lb. of lead. That in the slag may be found as follows: 785 lb. of slag assaying 0.8% would contain 785 times $0.008 = 6$ lb. lead. Total $9 + 6 = 15$ lb. of lead or $107 - 15 = 92$ lb. base bullion.

CHARGE SHEET

Name of Ore	H_2O	Weight Wet	Weight Dry	Pb %	Pb Wt	SiO_2 %	SiO_2 Wt	Fe and Mn %	Fe and Mn Wt	CaO and MgO %	CaO and MgO Wt	E %	E Wt	Cu %	Cu Wt
Roasted matte			50	15	8	2	1	50	25	1	1	8	4	12	6
Galena			165	60	99	16	26			10	16	10	17	1	2
Silicious ore			275			70	192	4	11						
Correction			330												
Iron ore			325			10	33	60	195						
Correction			216												
Limestone			325			3	7			54	121				
Coke		(150)				5	8	18	3	0.9	1	15	2		
Totals			1016		107 / 15 = 92		267		234 − 28 = 206		139		23 / 15 = 8		8

Knowing the weight of the base bullion its probable assay may next be computed. First compute the total weight of the gold and silver in the ores (not including the matte) from the assay values (Computation E), subtract from these amounts the weights going into the slag and the result will be the amounts going into the base bullion, not taking into account the other metallurgical losses such as volatilization and flue dust. The reason the matte is

*Abstract from 'Testing for Metallurgical Processes.'

†The amount of iron in the incoming matte is 25 pounds.

not taken into account is that while silver and gold are introduced into the charge by the roasted matte practically the same amounts will be taken out by the matte that is formed. Where matte is fed irregularly this short cut cannot be taken.

SLAG	Per cent
SiO_2	34.0
FeO	34.0 (Fe 26.4%)
CaO	17.0
Pb	0.8
S	0.8
Ag	0.5 oz

COKE (Per cent ash 15%, S)

Coke ash	Per cent.
SiO_2	75
Fe	18
CaO	9

MATTE	Per cent.
S	20
Pb	15
Cu + Fe	60

COMPUTATION (A) FACTORS

$\frac{28.4}{40.0} = 0.78$ iron factor.

$\frac{17.0}{34.0} = 0.5$ lime factor.

COMPUTATION (B)

$\frac{267}{0.34} \times 0.8 = 6$ lb. S in slag.

$22.7 \times 0.20 = 5$ " " volatilized.

Total 11 " " lost.

$\therefore 23 - 11 = 12$ " " to matte.

$\frac{8}{60} \times 100 = 13\%$ Cu in matte.

$\therefore 60 - 13 = 47\%$ Fe in matte.

$\frac{120}{0.20} = 60$ lb. of matte.

$60 \times (0.60 - 0.13) = 28$ lb. Fe in matte.

COMPUTATION (C)

$267 \times 0.78 = 209$ lb. Fe needed.

206 " " in charge.

3 " " lacking.

$3 \div 0.60 = 5$ lb. iron ore to be added.

$267 \times 0.5 = 134$ lb. CaO needed.

139 " " in charge.

5 " " excess.

$5 \div 0.54 = 9$ lb. limestone excess.

COMPUTATION (D)

$\frac{267}{0.34} \times 0.008 = 6$ lb. Pb in slag.

$107 - (6 + 9) = 92$ lb. wt. base bullion.

$\frac{60}{1036} \times 100 = 5.8\%$ matte fall.

$60 \times 0.15 = 9$ lb. Pb in matte.

COMPUTATION (E)

Assays galena = Ag, 50.0 oz.

$\frac{165}{2000} \times 50.0 = 4.125$ oz. Ag in galena.

$\frac{267}{0.34} \times \frac{0.5}{2000} = 0.197$ " " " slag.

3.928 " " " base bullion.

Silicious ore = Au, 1.00 oz.

$\frac{275}{2000} \times 1.00 = 0.137$ oz. Au in silicious ore.

trace " " slag.

0.137 " " " base bullion.

ASSAY OF BASE BULLION

$\frac{2000}{92} \times 3.928 = 81.0$ oz. Ag per ton.

$\frac{2000}{92} \times 0.137 = 2.98$ oz. per ton Au.

Revised Atomic Weights

BY F. H. MASON

In compliance with a general request that the result of its investigations may be made known at the commencement of the academic instead of the calendar year the International Committee on Atomic Weights has issued its report some three months in advance of the usual date. The object, as will be evident, is to facilitate the duties of both teachers and students by preventing changes after the work of the term has begun. The committee has investigated researches that have been made on the atomic weights of chlorine, lithium, platinum, phosphorus, rhodium, silver, strontium, tellurium, vanadium, and the group of inert gases. Changes, however, and these but slight, have been recommended only in the cases of argon, helium, krypton, lithium, neon, phosphorus, platinum, strontium, vanadium, and xenon. The change in the atomic weight of lithium is recommended from the research of Richards and Willard (*Jour.* Amer. Chem. Soc. 1910, 32, 4), who measured three distinct ratios, silver to lithium chloride, silver chloride to lithium chloride, and lithium perchlorate to lithium chloride. From these ratios they obtained the following values, lithium = 6.939, chlorine = 35.454, and silver = 107.571, as against the old figures, lithium = 7.00, chlorine = 35.46, and silver = 107.88. The committee, though stating that the new figures are entitled to great weight, in view of the excellent work done by other experimenters—notably Gray and Burt—deems it unwise in the case of chlorine and silver to make any hasty change, but in the case of lithium has adopted the figure obtained by Richards and Willard, rounded off to 6.94. In determining the atomic weight of strontium, Thorpe and Francis (Proc. Roy. Soc. 1910, 83A, 277) measured six ratios, silver to strontium bromide, silver bromide to strontium bromide, silver to strontium chloride, silver chloride to strontium chloride, strontium bromide to strontium sulphate, and strontium chloride to strontium sulphate, and obtained, as a mean, the figure 87.646 as the atomic weight of strontium. This closely agrees with the figure obtained in a recent research by Richards, 87.62, and the committee has adopted the intermediate figure 87.63. Baxter and Jones (*Jour.* Amer. Chem. Soc. 1910, 32, 298) measured the ratio of silver to silver triphosphate, and obtained for the atomic weight of phosphorus the figure 31.043. The rounded-off figure 31.04 has been adopted. The committee has provisionally adopted the figure 51.06 as the atomic weight of vanadium from researches by Prandtl and Bleyer (*Zeitsch.* Anorg. Chem. 1910, 65, 152, and 67, 257) on the ratio of silver chloride to vanadyle trichloride and on the analysis of vanadyle trichloride. In an elaborate investigation (*Proc.* Roy. Soc. Edin. 1909, 29, 721) on the composition of chloro and bromo platinates of potassium and ammonium, Archibald obtained, as an arithmetical mean of twenty-eight ratios, the figure 195.22 for the atomic weight of platinum. The figure 195.20 has been

adopted. The atomic weights of helium, neon, krypton, and xenon have been redetermined by Watson (*Trans.* Chem. Soc. 1910, 97, 810, and 97, 833), while Fischer and Hehnel (*Ber.* 1910, 43, 1435) have redetermined the atomic weight of argon.

The new atomic weights, then, that go into force at once, are: argon, 39.88; helium, 3.99; krypton, 82.90; lithium, 6.94; neon, 20.20; phosphorus, 31.04; platinum, 195.20; strontium, 87.63; vanadium, 51.06 (provisional); xenon, 130.20.

It is pleasing to note, in going over these reports each year, that Americans are coming more and more to the front in the accurate research work of determining the atomic weights of the elements, the foundation stone upon which analytical chemistry rests.

REQUISITES FOR AIR-HAMMER DRILL BITS

By G. E. Wolcott

In spite of all that has been written upon the proper shape of drill bits for different machines and different conditions, there is still considerable ignorance or misunderstanding of the proper requisites for a drill bit. Of first importance, in considering the matter, is the distinction between two types of stoping bars and the effect they have upon the behavior of the drill bit and upon the cutting capacity of the drill. There is, first, that class of machines in which the air goes through the stoping bar before going to the piston. By this arrangement a slight vibration up and down is produced and the bit partakes of this motion. This style of stoping-bar is exemplified in most of the older machines, such as the Murphy, Hardsoeg, Shaw, and Eclipse. Second, there is that class in which the machine is held up by a constant air pressure, as in the Waugh and Cleveland. In these machines the bit is held firmly against the rock with little vibration. The difference in effect of these arrangements is reflected in the cutting capacity of the machine and the difficulty of turning the bit in the hole. The first style gives a machine that will turn easily, but has a lower drilling capacity, while the second gives a machine that will turn with difficulty but has a higher cutting capacity for the same air consumption. It is evident, therefore, that the second arrangement is the more economical if the drill bit can be so shaped as to overcome the difficulty incident to turning it in the hole. A machine has often been condemned where a proper understanding of this point would have overcome the difficulty. Fig. 1 shows the construction of a bit which has been made to overcome the objection of difficult turning and which has been widely adopted for air-hammer machines. The dimensions given are such as would ordinarily be used for a starter bit where 1¼-in. ribbed steel is used. The object of the high centre is briefly this. When starting a hole with a square bit it is always found that there is a tendency, more or less pronounced, according to the nature of the rock and the shape of the face, for the bit to rotate about one corner of the steel rather than about the centre. The result is either a broken corner or difficulty in getting the hole started, or both. With the high centre, the latter strikes the rock first and rotation about the centre is easily effected. The result is that no difficulty or loss of time is experienced in starting a hole. Another advantage is that the drill stays sharp longer than with a square bit. The tendency in any bit is for the outer corners, which have the most cutting to do, to wear away or become blunt first. With the high centre the cutting is more equally distributed. In the illustration the angle between the faces of cutting edge has been shown as 90°. The exact angle is not material, but it is of the utmost importance that it should not be acute. It is natural to imagine that a sharp bit means fast cutting, but the reverse of this is frequently the case, especially with the second type

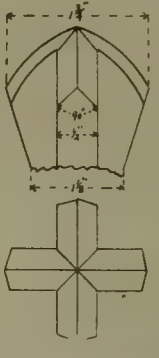


Fig. 1. Bit for Hammer Drill.

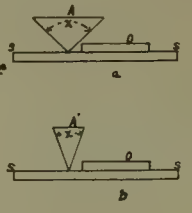


Fig. 2.

of stoping-bars mentioned. In Fig. 2 is illustrated the reason for this. In *a* has been represented by the wedge *A* the conditions which exist on a bit with a 90° angle, and in *b*, conditions with a bit having an acute angle. Suppose these wedges to be drawn along the smooth surface *ss* and to meet the obstruction *o*. The difficulty in passing over the obstruction will be proportional to the angle *x*. The result is that with a sharp bit either the obstruction must be broken off by the force exerted in turning the drill, or the point of the bit will be broken. In this case the operator, rather than the machine, does the work of breaking the rock. With a slight interruption in the turning, the difficulty at once increases as the hammer is continually striking and the relative height of the obstruction constantly increases until it is impossible to turn the bit. Another reason for the blunt edge is that a hard temper may be given it without danger of breakage, and in drilling hard ground this is a prime requisite. Often the importance of having proper steel with proper bits is not fully realized and too little attention is given to this point. The result is that in many cases hundreds of dollars are lost every month in wages paid to men who are doing nothing but waiting for steel or trying to perform work with such tools as render it impossible to accomplish good results.

Mount Lyell mine in Tasmania is one of the largest low-grade copper mines in the world. Smelting is accomplished there at a surprisingly low cost. The ores are wholly sulphide. Mining is done with steam shovels. A heavy overburden has to be stripped before the ore beneath is available.

The Work of the Tennessee Copper Company

By Knox R. Mercer

The Tennessee Copper Co. operates three mines, the Bura-Bura, the London and the Polk County. In all of these the character of the ore and methods of mining are the same. The Bura-Bura, which is the largest mine and producer, is the one described here, though mention is made of the others. The first discoveries were made in the Ducktown district about 1840. Operations were at first confined to the working of rich oxidized ores near the surface. Upon the exhaustion of these, attempts were made to treat the low grade sulphides, but this proved unsuccessful and work was abandoned about 1878. In 1897, the exploration and development of the Bura-Bura and the London mines were undertaken by diamond drilling, and as the results proved favorable the Tennessee Copper Co. was organized. This company bought later the Polk County mine and started development in 1899. Construction of the railroad, roast yards, and smelters soon followed.

The practice of heap roasting preliminary to smelting in blast-furnaces was at first employed, the matte so produced being blown to blister copper in converters. This continued until 1904, when the present process of 'raw sulphide' or 'pyritic' smelting was introduced. The process as employed at Ducktown is today the best example of straight pyritic smelting to be found in the United States.

The rocks in the Ducktown district consist mainly of gneiss and mica schists. Folding and faulting is thought to have occurred and the ore deposit is found along fault fissures. The strike of the strata is northeast, while the dip is southeast at an angle of about 75 degrees.

The ores occur in semi-detached lenticular deposits, the longer horizontal axis of the lenses running parallel with the strike of the country rock, and dipping in the same direction but at a slightly steeper angle. The detachment is thought to be due to cross-cutting fault lines at acute angles, resulting in horizontal throws of 30 to 60 ft. The average width of the orebodies is 50 ft., the maximum 180. The veins show clean-cut foot-walls. The hanging wall is poorly defined and the limit in that direction is an economic one. Mining is continued in the direction of the hanging wall until the ore becomes too poor to mine. The mines are comparatively dry, one small pump, running six hours per day, handling all mine water.

The ore consists largely of pyrrhotite with chalcopyrite and iron pyrite; blende and galena are also present in small amounts. The chalcopyrite contains the copper, which amounts to about 2%. Because of the large amounts of pyrrhotite and pyrite, the iron content is high, 30 to 40%. In the gangue are found garnet, zoisite, horn-blende, pyroxene, calcite, and quartz. Mica occurs on the hanging-wall side. Zoisite occurs chiefly in the Polk County mine.

	Bura-Bura per cent	London per cent	Polk County per cent
Fe	[illegible]	[illegible]	[illegible]
S	39	36 to 41	39 to 42
*Insol.	12	10	14
Cu	2	2	2
Zn	1	1	1
CaO	4 to 5	6 to 7	6 to 7
Al2O3		7	3 to 4
MgO		2	3

*Including: in Bura-Bura ore, SiO2 12; silicates 7. in London SiO2 8 to 10, silicates 4 to 6; in Polk County, SiO2 28 to 30, silicates 4 to 6.

Methods of mining employed are similar in all the mines, and are best shown at the Bura-Bura. The main shaft is sunk in the foot wall rock at some distance from the orebody; at the Bura-Bura this distance is one hundred feet, and the shaft has an inclination of 75°. Levels are opened every hundred feet, the first level at the Bura-Bura being 172 ft. from collar of shaft. Six levels are in operation here and the shaft is sunk to the eighth. The ore extends, no doubt, to still greater depths. Cross-cuts to the ore are driven on each level and connections between levels made opposite the shaft by raises. Stopes are started in both directions on the vein, resulting in two stopes the full width of the body and 70 ft. high, leaving a pillar 30 ft. thick between levels. In addition pillars are left wherever it is considered necessary. These pillars are comparatively few in number, but make timbering largely unnecessary. Eventually all pillars and floors will be robbed. The ore is shot down from the working face and at the foot of the stopes is shoveled into cars holding 2½ tons. It is trammed to the shaft, dumped into 5-ton skips, and hoisted to the surface. Exploration is carried out by means of drifts driven on every third level, in which, at every 100-ft. station, holes are bored with diamond-drills in both the hanging and foot-walls, and the width of ore determined. Development is now under way at the old McPherson shaft, which has been cleaned out and sunk to the third level, at which point it can be connected with the corresponding level of the Bura-Bura. The connecting drift will be slightly over a quarter of a mile long. All drilling is done with 3¼-in. Rand drills. All labor in the mine is done by contract. A drill-runner is paid 15c. per foot and he pays his helper $1.75 per day. Thirty feet is drilled per day on the average, and a good man can make forty. The record is 1000 ft. in one month. The ground is hard. Trammers are paid 28c. per car. Blockers receive $1.90 per day and shoot their own holes; all other holes are shot by the powder gang.

At the surface the ore is dumped into a receiving bin from which it is fed into an 18 by 36-in. Blake crusher, from which it is carried by means of a conveyor belt to storage bins of 2000 tons capacity. While on the belt all barren rock is removed as far as possible by hand picking. From storage bins the ore is drawn into cars and hauled over the company's railroad to the smelter, a distance of about seven and a half miles. Track is standard gauge, 65-lb. rail being used.

The surface plant of the Bura-Bura mine consists

of a wooden shaft and crusher house 125 ft. high, brick power and boiler houses, together with various wooden buildings as office, shops, and change rooms. The power-house contains a Nordberg first-motion hoisting engine with 18 by 32-in. cylinders, with two conical drums 7 ft. diam. at the small end, 9 at the large, and with a 5-ft. face. Air is furnished to the drills at 80-lb. pressure from Nordberg two-stage compressors. The air cylinders are 15 by 24 by 42 in.; the steam cylinders are 14 by 28 by 42 in. The capacity of these compressors is 2000 cu. ft. of free air per minute. The boiler plant consists of four 150-hp. Babcock & Wilcox water-tube boilers, equipped with Murphy automatic stokers. A small dynamo furnishes light.

At the London mine there is a shaft similar to that of the Bura-Bura. It has a depth of 562 ft., and five levels are open. The Polk County mine is opened by a vertical shaft sunk to the depth of 385 ft. where the fourth level is opened. Three levels are in operation. The production from these shafts is Bura-Bura, 1100 tons per day; London, 250; Polk County, 250.

At the smelter the ore is dumped into bins of 10,000 tons capacity, which are divided into compartments of 250 tons. Each of these is provided with a chute controlled by a gate through which the ore is drawn into small side-dumping charging cars, in which it is drawn to the furnaces by electric locomotives. The cars have a capacity of 44 cu. ft. Four tracks run under the bins, provided with scales for weighing the charges. Tracks are arranged so that cars loaded at any bin may be dumped into either side of any furnace.

There are 7 blast-furnaces, 4 being 56 by 270 in., and 3, 56 by 180 in. at the tuyeres. The height from the tuyeres to the charging floor is 18 ft. From tuyeres to sole plate is $3\frac{1}{2}$ ft. Sole plates are of cast iron and are water-cooled. The small furnaces have twenty-six 5-in. tuyeres, and the larger ones fifty $3\frac{1}{4}$-in. tuyeres, arranged in pairs, one pair to each section. On one of the larger furnaces the space between each pair of tuyeres has been cut out, making the tuyere opening a slot 4 by 12 in. The results obtained are good, pressure being reduced and capacity increased, though more air is required. Air is furnished to the furnace under 50-oz. pressure. The blast is cold. Each furnace consumes 70,000 to 90,000 cu. ft. of air per ton of ore smelted, or about 1000 cu. ft. of air per minute per foot of length. Each furnace is provided with a circular settler 16 ft. diam. and lined with fire brick. In these the furnace products are allowed to separate, the slag overflowing through a slag tap into pots of 105 cu. ft. capacity, in which it is hauled to the dump. The low-grade matte is tapped from a lower level at intervals into pots similar to those used for the slag. The matte from the green-ore furnaces goes to cooling beds; that from the concentrating furnaces to the converter. The converter slag is also poured into these settlers and allowed to settle, no attempt being made to re-smelt this slag. This is new, converter slag generally being re-smelted. The shells of slag formed in the ladle by cooling form the only part of the converter slag re-smelted at this plant.

There are fifteen converters of the Leghorn type, 7 by $12\frac{1}{2}$ ft. in size and four electrically operated stands. Two 40-ton electric cranes handle matte from furnaces to converters. Converters are lined with a mixture of clay from Georgia and ground quartz-ragging from the quarry at Astral, this being crushed to $\frac{3}{8}$ in. The materials are mixed in a pug-mill. From it the mixture is hauled to converters undergoing repair, shoveled into them and tamped about a core. Air hammers or tampers are employed. Linings last two charges or blowings.

The furnace gases, consisting chiefly of SO_2, SO, CO_2, O, and N, together with the flue dust, are discharged either wholly or in part into a brick-lined balloon flue or a concrete flue below the furnaces, as desired. Both flues discharge into a dust chamber 209 by 30 by 20 ft., at the end of which is a radial stack of pressed brick 325 ft. high. The flue dust is removed from the chamber by two 12-in. conveyors. At the time of my visit no attempt had been made to briquette and re-treat the dust. A briquetting plant was soon to be erected. White presses were to be used. The flue dust formed and collected amounts to $1\frac{1}{2}$% of the charge.

Smelting is carried on in two stages, 80% of the total sulphur content being eliminated. The remainder is expelled in the converters. In the first stage green ore is fed with coke to the furnace, but no fluxes other than quartz. A low-grade matte carrying 13 to 15% copper is produced. The slag is dumped, and the matte is hauled to the cooling beds, dumped and allowed to cool, then broken up and hauled to bins. In the second stage the matte from these bins is fed to the concentration furnaces with quartz, coke, and limestone. The slag formed is dumped and the matte, which now carries between 30 and 40% copper, is sent to the converters and blown to copper 99.4% fine. The converter slag is run back to the furnace settlers while the copper is cast into pigs weighing about 225 lb. in which form it is ready for the market.

FURNACE CHARGES AND PRODUCTS

GREEN ORE FURNACES

Charge.	Pounds.	Slag.	Per cent.
Ore	1500	FeO	39 to 42
Quartz	300 to 1500	SiO_2	39 " 42
Coke	150 to 250	CaO	7 " 8
Products.		MgO	2 " 3
Matte, 13 to 15% copper,		Al_2O_3	4 " 4.5
to concentrating furnaces.		ZnO	1 " 1.2
Slag, to dump.		Cu	0.25 " 0.35

CONCENTRATION FURNACES

Charge.	Pounds.	Slag.	Per cent.
Matte	2500	FeO	40 to 45
Quartz	1400	SiO_2	35 " 40
Limestone	700	CaO	10 " 12
Coke	100	MgO	2 " 3
Product.		Al_2O_3	2 " 3
Matte, 30 to 40% Cu, to		ZnO	0.5 " 1
converter. Slag, to dump.		Cu	0.3 " 0.4

A matte carrying 30 to 40% copper could be obtained upon first smelting if desired, but it was found better to carry the process on in two stages as outlined, because the loss in copper is greatly reduced, a better saving obtained, and profits increased. More ore is mined and smelted from the Bura-Bura

than the other mines. The result is a high per cent of iron present, which must be fluxed as a silicate by the addition of quartz. The amount of iron present always influences the amount of quartz necessary, which requires and is accorded the closest attention. The quartz used is obtained at Astral, Tenn., and contains 96 to 98% silica. Formerly it had been obtained in North Carolina, but the cost was high, so the company bought its present holdings from which it procures all quartz necessary.

A West Virginia coke with a 12% ash is used. The total used in the two smelting operations is about 6 to 7% of the total weight of ore smelted.

Limestone is added in the second or concentrating stage of the process. This is a new practice at the plant. Formerly the iron was slagged as a straight iron silicate; now, by replacing part of the iron with calcium, an iron-calcium silicate is produced. A lighter slag results and a much better separation of slag and matte is obtained in the settlers. The limestone is from the Georgia marble quarries.

Water for jacket and general use about the plant is pumped from the Ocoee river by two motor-driven, 10-in. turbine pumps having a capacity of 2800 gallons per minute. The jacket water is run by means of a flume or race to a pond below the smelter, where it is cooled and pumped back into a second and lower series of tanks, where it is again ready for use in the furnaces. About 7% of heat is lost in the process.

All copper determinations are made by the electrolytic method. A one-sixth horse-power alternating-current motor furnishes the power. Series devices are used on a direct current where high-current densities are employed with lamp rheostats. An interesting feature of the practice is the use of rotating anodes, with which a complete analysis can be made in from 20 to 30 minutes.

The latest development is the erection and operation of a sulphuric-acid plant. Construction began early in 1906, and acid-making commenced on December 1, 1907. Owing to the changes necessary to be made to the tops of the green-ore furnaces which furnish the gas, full capacity had not been reached at the time of my first visit. Then but two furnaces were feeding the plant. From the gases supplied 400 tons of commercial 60 H_2SO_4 was manufactured daily. This was to be increased to 800 tons when the other two furnaces were put in commission. This will place the Tennessee Copper Co. at the head of the sulphuric acid industry and will do much to reduce the cost of both the commercial and refined acid in the United States.

The essential features of the plant are the same as in the ordinary sulphuric-acid plant. The chief difference is the source of the gas supply, which is in this case the gas from the green-ore blast-furnaces. The acid plant consists of 2 Glover towers; 12 lead chambers, 50 by 50 by 70 ft.; 4 Gay-Lussac towers; 10 storage tanks, 700 tons each.

Only the fumes rich in SO_2 (those from the green-ore furnaces carry over 6% of this gas) are used in the manufacture of the acid. These fumes carry not only SO_2, but SO_3, CO_2, O, and N as well. These gases are drawn from the furnaces to the concrete flue back of and below them. From this flue the fumes are taken into the Glover towers. Here the sulphur content is converted to SO by addition of nitrous oxides obtained from a solution of $NaNO_3$ in dilute H_2SO_4. The gases then pass to the lead chambers, which they enter at a point near the top. Here they are met with a jet of steam, the following reaction taking place:

$$SO_2 + H_2O = H_2SO_4.$$

The H_2SO_4 precipitates to the bottom of the chambers while the spent gases pass to the Gay-Lussac towers where the nitrous oxides are recovered by dissolving them in H_2SO_4. The remaining gases then pass from the Gay-Lussac towers through the flue leading to the stack, and thence to the atmosphere. The acid in the chambers has a specific gravity of about 1.58. This is sampled and tested from time to time by means of taps in floor of the chambers. From the chambers the dilute acid is sent back to the Glover towers, where it is concentrated to a specific gravity of about 1.75, after which it is passed to the storage-tank preparatory to loading into lead-lined tank-cars. These cars have a capacity of about 55 tons each and in them the acid is marketed.

The works of the company are under excellent supervision and are notable for the large amount of experimental work that has been carried out in them. The results have amply justified the liberal policy that has been adopted.

VANADIUM STEELS

The following, from a pamphlet issued by the Vanadium Steel Company of Pittsburg, is of interest, as it describes the effects of vanadium when added to steel. Vanadium exerts its power in at least three ways.

1. It indirectly toughens steel owing to its powerful scavenging action, removing oxides, nitrides, etc., in a fusible form easily carried away to the slag. In this respect it differs markedly from some other deoxidizing alloys.

2. It directly toughens steel mainly by its solid solution, under normal conditions, in the carbonless portion known as ferrite. To succeed in this respect, the allow must contain either free vanadium, or vanadium combined with some other element which also goes into solid solution in ferrite under normal conditions, such as silicon.

3. It forms complex carbides of such natures as to statically greatly strengthen the steel containing them. These carbides are proved to add more strength to steel when they contain chromium or nickel.

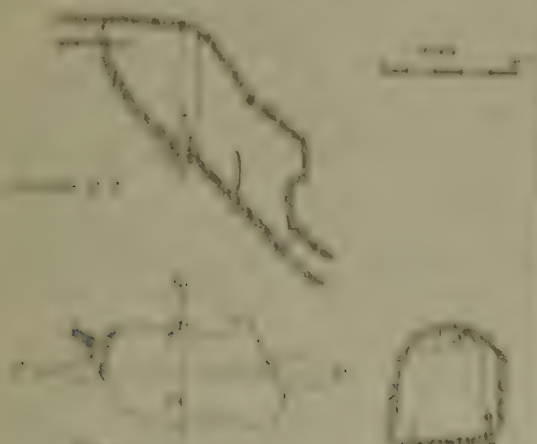
There is no one type of vanadium steel that does all things. It is necessary to make various kinds and grades for different purposes to which different vanadium steels have been successfully applied.

In the tables presented, with regard to composition and heat-treatment, the results have been mainly deduced from experience with basic open-hearth chrome-vanadium steels, and are corroborated by service records and by exhaustive microscopic investigation.

Surveying an Inaccessible Stope*

By C. A. Perkins

A mining company decided to install a plant for the purpose of handling fine tailings that ran out at about 200 tons per hour and having a large quantity of filling [illegible] at adjacent mills. The stope was to be sufficiently large to originate the entire plant [illegible] tailings. I was instructed to survey the stope and to determine the location of the boundary, so that a good approach to possible ore might be planned. In order to make a model of the stope the accompanying sketch shows the general outline of the stope as attempted using mostly to indicate details. Owing to the fact that the back of the stope was about 15 ft above the filling that had been left in it some of the ordinary methods of surveying was applicable. To complete the problem there were few places where a transit could be set up, and the walls being nearly vertical the only contact that could be reached was not above 8 ft above the filling. It was not possible nor practicable to attempt to use ladders and platforms were hard to be constructed and to start a movement of the filling which was promptly put behind the intermediate level shown at the top of the stope and where it was necessary, to station a transitman.



Obviously the first method was that of triangulation from two or more known points. Instead of using the transit to measure angles at the walls, which is inconvenient with little room to work, a direct light was used, as in the form of lighting one that a point could be sighted from two or more points and the angles measured from a common base line. I found it simpler to measure the vertical plane from a point directly over the point to be located, and a horizontal base line from which the angles were measured. Under ordinary conditions in a mining stope it is necessary to have the horizontal distances of two points, from which the required point can be triangulated, known. This was given by the plan of the stope, which was drawn to a scale of 1 in. = 10 ft. The elevations were obtained by means of a transit and level.

Using [illegible] as a base line at the point marked A on the map, where the transit was first placed, the stope and the others at B and C. The range at A was particularly long and owing to the inclination of the filling starting to cave. B and C were used for points not so much because they were desirable, although a fairly good view of the stope could be had from both, but because they were practically the only places left where a transit could be set up and not slide out of position when the transitman moved. No transit points were set at these places, as it was impossible, but the line was carried to a convenient position in the lower portion of the stope. The transitman at A entered through the intermediate level. When a sight was to be taken, all the lights except the camera light were extinguished, a spot on the wall was chosen, the light projected on it, and the two transitmen who could get the best view would sight to it. The vertical angle at each transit was read for a check. The greatest distance a point was sighted was about 45 ft; all elevations checked within 0.30 ft, proving the work to be accurate not only for elevations but for positions of the points as well, within reasonable limits.

Loss in Weight Due to Roasting.—When an ore is assumed to be roasted, as must often be done in preliminary calculations, it is necessary to approximate its analysis without resort to actual trial. Since oxygen (16) is one half the atomic weight of sulphur (32), in roasting from sulphides to oxides the loss in weight can be approximated as one half the loss of sulphur. Example:

Analysis original ore	Per cent in 100 lb. ore.
SiO_2	60 or 60 lb.
Fe	20 " 20 "
S	20 " 20 "
Total	100 in 100 lb.

Roasted to a product containing 5% sulphur, loss in weight = $100 - \frac{80}{5} = 92\frac{1}{2}$ lb., therefore in $92\frac{1}{2}$ lb. of roasted ore there is SiO_2 60 lb., Fe 20 lb.

The new approximated analysis would be:

	Per cent
SiO_2	$\frac{60}{92\frac{1}{2}} \times 100 = 64.8$
Fe	$\frac{20}{92\frac{1}{2}} \times 100 = 21.6$
S assumed	= 5.0

The following easy tables by Hoffman show the [illegible] possible at the different silver [illegible] with the accompanying effect on the temperature. The metallurgist must not be misled by the low temperature points of the higher silicates and sulphides as they need a temperature considerably higher to flow properly. They may be fused successfully at some [illegible] on account of the high temperature required.—Ed.

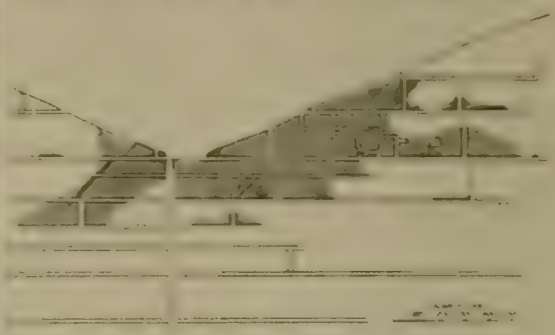
Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of mining and allied matters pertaining to mining and metallurgy. The editor welcomes the expression of views contrary to his own, believing that [illegible] the publication of such views is conducive to the promotion of interest in the conduct of this paper.

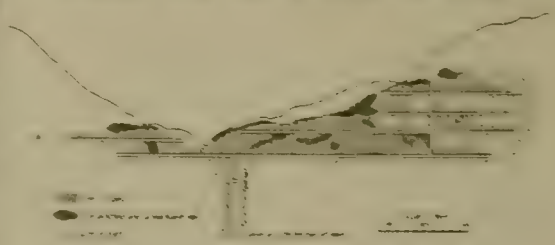
Surface Indications of Ore-Shoots in Depth

The Editor

Sir:—I do not agree with W. H. Storms in his contention that it is rarely if ever, that ore shoots or the value occurring in a vein, extend through that portion of the vein underlying a canyon, gulch or natural depression which crosses the strike of the vein and that it seemed a safe proposition to steer clear of mines situated in gulches so crossing the strike of the vein, or in a country cut by a succession of short ravines. The accompanying longitudinal sections are of the Eureka & Excelsior mine in the Sumpter district, Oregon, and of the Liberty Bell, at Telluride, Colorado, both of which have been previously published. Of the former I have personal knowledge, and without question Mr. Storms' theory does not hold good in this instance. The section of the Liberty Bell is from an official report, and seems to also negative Mr. Storms' theory. I could cite numerous cases in California mines, in Grass Valley, and other districts, where the ore-shoot continues unbroken and with no appreciable difference in value in that portion of the vein underlying one or more gulches. As these mines were studied while under professional engagements, I do not, at the present time, feel at liberty to go into detail concerning them. Unfortunately, I lack sufficient detailed data concerning those mines where I would feel no hesitancy in discussing Mr. Storms' theory, and to undertake to do so would be a matter of little interest or profit, but I may say that without exception wherever I have had occasion to note the conditions described by Mr. Storms of canyons or gulches crossing the vein in its strike, I can recall no instance where such depressions, unless formed near the contact of different rocks or along a fault plane, seemed to bear any relation to impoverishment of the ore-shoot underlying same, if there was any in the vein up to that point. I believe, on the contrary, that under certain conditions, secondary enrichment has proceeded to a limited extent in such places. The impoverishment or pinching of a vein passing into a different formation is of common occurrence whether the point of contact happen by chance to be under a gulch or not, and the erosion of the orebody, by the agencies forming the gulch or ravine, is, of course, frequent, but these, however, are not the points that Mr. Storms wished to make. I have noticed that certain surface conditions or indications at some mines apparently had some connection with the character of ore-shoots or vein occurrences directly below those points, and, in some instances, there has been a remarkable similarity of these conditions at different mines. I hope before long to be able to get my notes in shape on the subject. I think that an attempt to judge the value of a mine or prospect from the topographical features would be rather a dangerous [illegible] and a matter that would appear later to the promoter than to the mining engineer and to the former of course [illegible] to the prospect. While there is much of interest in Mr. Storms' article, and many statements made with which I agree, I must say that I do not approve of nor agree with his statement in paragraph 10 as follows: "There is no means by which the value of ore beneath the surface as yet undeveloped may be even approximately determined, regardless of all signs at the surface, favorable or otherwise. Only actual development can make this condition known." If Mr. Storms means the above to apply only to the topographical features it does not seem clearly stated, and if the intention is to imply that there is nothing to be determined from a study of the surface showing to just [illegible] the



Longitudinal Section Eureka & Excelsior Mine, Oregon.



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CHARLES JANIN.

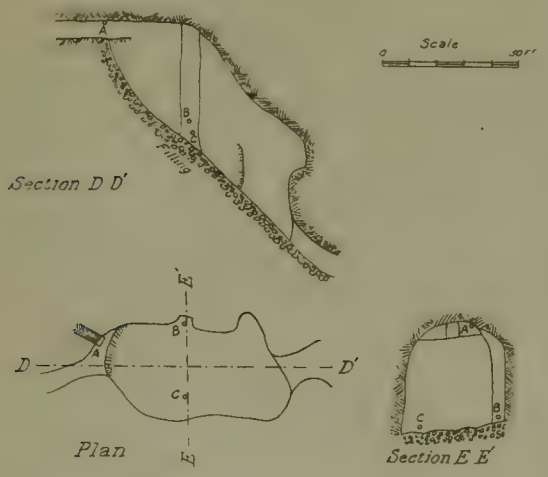
San Francisco, November 10.

Arsenical sulphide ores upon natural oxidation usually present a peculiar yellowish green color which is easily remembered. In some districts miners erroneously refer to this color as tellurium stain.

Surveying an Inaccessible Stope

By A. E. Robinson

A mining company, working its mine by the process of breaking and sorting the ore in stopes, and filling with waste, had drawn a large quantity of filling from an abandoned stope. This stope was in rock sufficiently firm to support the sides and back without caving. I was directed to survey this stope and to determine the position of the boundary walls with as great accuracy as possible, as it was desired to make a model of the workings. The accompanying sketch shows the general outline of the stope, no attempt being made to indicate details. Owing to the fact that the back of the stope was about 45 ft. above the filling that had been left in it, none of the ordinary methods of surveying was applicable. To complicate the problem, there were few places where a transit could be set up, and the walls being nearly vertical, the only contour that could be reached was one about 8 ft. above the filling. It was not possible, nor practicable, to attempt to use ladders, and extreme care had to be exercised not to start a movement of the filling, which rose abruptly just below the intermediate level shown at the top of the stope, and where it was necessary to station a transitman.



Obviously the best method was that of triangulation, but the difficulty of using this method lay in getting points on the walls. After experimenting with little success with different lights and reflectors, in the hope of finding one that would cast a single concentrated beam of small diameter to a distance equal to the maximum distance of any point on the wall from the transits, I acted on a suggestion of Rush J. White and tried passing a ray of light through a camera lens. I found that by removing the ground glass from a 4 by 5 camera fitted with a Gundlach telephoto lens, and placing a Baldwin acetylene mine lamp in the back of the camera, it was possible to project a small beam of light of sufficient brilliancy to illuminate a circle about 0.10 ft. diameter at a distance of 10 ft. from the camera. The diameter of this circle increased in direct proportion to the distance, and was visible through the telescope of a transit as far as 60 ft. A stronger light, had one been available, would have been desirable, for the reason that at distances of 30 ft. and over, there was some difficulty in bisecting the circle of light with the crosshairs.

Three transits were used: one at the point marked A on the map, where the intermediate level joined the stope, and the others at B and C. The setup at A was particularly dangerous owing to the liability of the filling starting to cave. B and C were used for points, not so much because they were desirable, although a fairly good view of the stope could be had from both, but because they were practically the only places left where a transit could be set up and not slide out of position when the transitman moved. No transit points were set at these places, as it was impossible, but the line was carried to a known position in the lower portion of the stope. The transitman at A entered through the intermediate level. When a sight was to be taken, all the lights except the camera light were extinguished, a spot on the wall was chosen, the light projected on it, and the two transitmen who could get the best view would sight to it. The vertical angle at each transit was read for a check. The greatest distance a point was sighted was about 45 ft.; all elevations checked within 0.30 ft., proving the work to be accurate, not only for elevations, but for positions of the points as well, within reasonable limits.

Loss in Weight Due to Roasting.—When an ore is assumed to be roasted, as must often be done in preliminary calculations, it is necessary to approximate its analysis without resort to actual trial. Since oxygen (16) is one-half the atomic weight of sulphur (32), in roasting from sulphides to oxides the loss in weight can be approximated as one-half the loss of sulphur. Example:

Analysis original ore.	Per cent in 100 lb. ore.
SiO_2	60 or 60 lb.
Fe	20 " 20 "
S	20 " 20 "
Total	100 in 100 lb.

Roasted to a product containing 5% sulphur: loss in weight $= 100 - \frac{20}{2}^{5} = 92\frac{1}{2}$ lb.; therefore in $92\frac{1}{2}$ lb. of roasted ore there is SiO_2 60 lb., Fe 20 lb.

The new approximated analysis would be:

	Per cent.
SiO_2 $\frac{60}{92.5} \times 100$	$= 65.0$
Fe $\frac{20}{92.5} \times 100$	$= 21.6$
S assumed	$= 5.0$

The following slag tables (by Hoffman) show the variation of constituents possible in the different silicate degrees with the attendant effect on the temperature formation. The metallurgist must not be entirely guided by the low formation points of the highly silicious bisilicates as they need a temperature considerably higher to flow properly. They may be used successfully in semi pyrite smelting on account of the high temperature attained.—Barr.

Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of mining and metallurgical matters pertaining to mining and metallurgy. The Editor will welcome the expression of views contrary to his own, believing that conflict of opinion is necessary to the truth. Publication of any contribution is determined by its possible interest to the readers of this journal.

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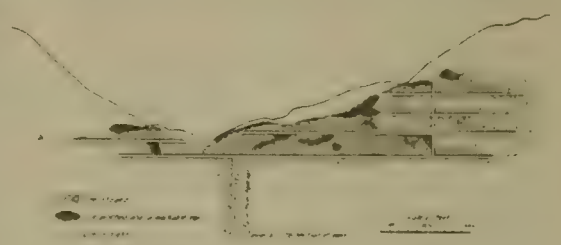

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Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Borax glass when kept long in a moist climate tends to run together and must be re-crushed before being used. For this reason it is now supplied in tin-lined cases.

Mining locations should be laid out on the surface in such manner that the side lines parallel the outcrop, regardless of the true strike of the vein. A vein with considerable dip—45° more or less—will appear to have a very different strike on a sidehill crossing the vein than it actually has.

Average cost of mining and milling on the Mother Lode of California ranges from $2 to $4 per ton, depending on the magnitude of mining operations in both mine and mill. Surrounding economic conditions are also an important factor. A mine that can be operated through adits has an advantage in working cost over one operated through a shaft.

Time required in sinking shafts in the greenstone of the Mother Lode is usually divided about as follows: drilling with machines, 12 hr.; clearing away broken rock and squaring up, 8 to 9 hr.; handling men, timbers, supplies, and materials, setting up and taking down machines and clearing the bottom of the shaft from smoke and gas, 3 to 4 hours.

Ammonium cyanide is a more efficient solvent of gold for silicious gold ores containing a small amount of cyanicides, particularly copper carbonate, than potassium cyanide alone. It is said that a still better solvent for the gold in ore of this description is potassium cyanide to which has been added a small amount of ammonia. The quantity of ammonia required varies with the strength of the solution.

All pipes in mills in cold countries used for carrying water, solution, steam, or any liquid should be so placed that they may be completely drained by means of valves situated at the lowest point, so that in the event of the mill being closed down, even temporarily, these valves may be opened and the pipes cleared. This will prevent freezing, and possibly the splitting of the pipes by formation of ice.

Neither a millsite nor a placer claim can be entered by a stranger for the purpose of prospecting for a quartz vein or other mineral deposit, for the reason that he is a trespasser. The law pre-supposes that a millsite is non-mineral land, and no one has the right to assume that a quartz vein is hidden under the surface of the gravel of a placer claim. Even if it does occur the vein cannot be sought by the outsider.

The hardness of minerals is determined by comparison with minerals of known hardness. The scale adopted by standard mineralogists is: talc, 1; gypsum, 2; calcite, 3; fluorite, 4; apatite, 5; feldspar, 6; quartz, 7; topaz, 8; sapphire, 9; diamond, 10. Occasionally minerals differ somewhat from the arbitrary scale, different specimens of the same mineral varying a little in hardness. This property of minerals is sometimes deceptive, granular varieties appearing to be much softer than the crystallized specimens. Thus a friable quartzite may seem to be softer than a quartz crystal, when, in fact, the individual grains of the granular rock are as hard as the crystal.

The discoverer of a vein within the lines of an agricultural patent, if not the owner, may be able to locate the vein on its strike, outside of the agricultural patent and 'construct' a location on the vein the same as though no prior title existed. Such constructive location, however, does not give the mine locator any surface or underground rights within the lines of the agricultural patent. The miner may take his extra-lateral right, based on such discovery, from the surface downward on the dip of his vein along that portion lying without the patent, and he may also take the same right from a line along the vein beginning outside of and directly under the line of the agricultural patent. No vein within an agricultural patent is entitled to extra-lateral right.

Air compressors should be supplied with the coolest and purest air obtainable. For this reason the intake-pipe should be extended outside the compressor building. If there be a leak leading from the cylinder to the intake-pipe which permits some of the compressed and heated air to return to the intake, there is danger of the compressor becoming hot and either exploding the jacket or setting fire to any oil that may be present in either cylinder, receiver, or pipe. This burning oil would then be forced into the main line of the system and into the mine workings through the exhaust of the drills, an unhealthy if not dangerous thing for the workmen. In some instances of this kind the men have been overcome with carbonic acid gas. This is known as the 'inflaming' of compressors.

Temperature, since the time of Galileo, has been measured by the expansion of mercury in a glass tube. The unequal expansion is divided into degrees and values are based upon the position of two fiducial points. Galileo had a scale of 360 degrees, the lowest point based upon some freezing mixture and the highest representing the warmest day of summer. Fahrenheit had several scales. In the one finally adopted the zero is based on the temperature of the coldest day of the year 1709 in northern Europe. Réaumur used melting ice and boiling water, dividing the distance into eighty degrees. Celsius, using the same points, divided the distance into one hundred degrees, with the zero at the boiling point. This scale is often referred to as identical with the Centigrade, but this is a mistake. Linnaeus modified Celsius' scale, making the zero indicate the temperature of melting ice and one hundred degrees that of boiling water. This is the widely used Centigrade scale. Concerning the Fahrenheit scale, it may be noted that it has practically lost place in scientific usage today. Furthermore, in all our thermometric scales the so-called fixed points are not truly fixed.

Special Correspondence

BULAWAYO, SOUTH AFRICA

Gold Output of Southern Rhodesia — Important Flotations — High-Grade Ore in Matabeleland

[illegible] of the mineral output of Southern Rhodesia for August [illegible] compared with £[illegible] for July. The total was valued at £[illegible] or £[illegible] more than for the preceding month. In these estimates only the product of mines in Southern Rhodesia is [illegible] treatment [illegible] although there has been for [illegible] the past few months more gold than at any other time in the history of the country, and that while Rhodesian mining properties are in keener demand than ever, the gold output has declined [illegible] since last March, when the value of the gold [illegible] was £[illegible]. The April return was £[illegible], that of May £[illegible], for June £[illegible], for July £[illegible], and for August £[illegible]. The continued decline is largely due to the fact that the number of gold producers has been greatly reduced during the last seven months, as many properties then in the hands of small syndicates and regular producers, have lately been taken over by wealthy companies. These large companies have suspended work at the small plants and have adopted a policy of vigorous development to open the claims acquired and to prepare them for larger crushing equipment. Another factor which has greatly affected the output for the past two months has been the closing down of the mill of the Globe & Phoenix company, which was the largest producer in the country. This was necessary owing to the condition of the main shaft. Repairs have been completed and the property will continue to contribute largely to the gold output of Matabeleland. The results of recent development at the 16th and 17th levels point to the persistence of the orebody to great depth, and thus far the gold content of the vein is higher at depth than nearer the outcrop. Before the hanging up of the 40 stamps of this company the average monthly return from January to June was about £30,000, whereas in August the company's output was less than £2000, derived from the retreatment of sand. Apart from gold, the following mineral output is reported by the Rhodesia Chamber of Mines for August: silver, 19,312 oz., £1985; lead, 63.7 tons, £701; copper, 4.37 tons, £218; chromic iron, 624[illegible] tons, £13,875; asbestos, 30 tons, £300; coal, 16,794 tons, £8060.

Since the beginning of 1910 fully 40 new Rhodesian limited liability companies have been registered in London, Salisbury, and Pretoria, and new flotations are still being announced. Never in its history has Rhodesia attracted so many prospectors and speculators, and so much capital as at present. All over Matabeleland and Mashonaland, agents of Johannesburg, Bulawayo, Salisbury, and London firms are to be found, and blocks of claims have changed hands at extraordinary figures. Many fortunes have been made and men who two or three years ago were struggling to make both ends meet with a 2 or 3-stamp mill, are now wealthy and have left for Europe with large checks signed by well known South African magnates. Among the most important deals concluded of late were the sale of the Lonely mine owned by Palca and Aserman to the Rhodesia Gold Mining & Investment Co. for £125,000 cash and 75,000 shares; the Csardas mine to Abe Bailey for £50,000; and of the Colossus mine to Mr. Arnold, of Salisbury, for about £30,000. Other important transfers are reported in connection with the Cam and Motor mines, the Masterpiece, the Planet, the Bell, and properties in Enterprise district. Nearly all these ventures have been floated as limited liability companies, and in consequence two or three millions sterling in working capital has been raised in South Africa and London for Rhodesian mines. Among the best known South African magnates who have recently invested largely in Rhodesian mining is R. R. Hollins of London and Johannesburg, who has acquired, among other properties, the Bush Tick, a big low-grade property near Essexville, in Matabeleland, which is to be equipped with one of the largest slime plants in the world, and the Shankuru, Planet, and [illegible] mines in Mashonaland. [illegible] and control of the Globe [illegible] Mr. Hollins [illegible] Rand. A new company has been formed [illegible] with a capital of £[illegible] and a working fund of £[illegible] to take over and work these mines, which [illegible] the company proposes to develop [illegible] Living Stone. The Rock Flue [illegible] is expected to prove to be one of the largest mines in Matabeleland and will no doubt be the subject of immediate flotation at an early date. The development of the Lonely Reef mine in the Bubi district of Matabeleland continues to be most encouraging. During August a 10-stamp battery crushed 1,220 tons. The yield from the plates was 651 oz. and from sand 319 oz. The equipment is being largely increased and among the features of the new plant will be Pachuca tanks, the first I believe to be installed in Southern Rhodesia. The capacity of the new equipment will be 1000 tons per month and it is anticipated the new plant will commence work in January. The consulting engineer, C. B. Kingston reports that at the end of June the ore reserves were 36,898 tons of an average assay value of 20.9 dwt. over a stoping width of 36 in. He calculates that by the end of the current year the ore blocked out will have been increased to 70,000 tons. H. B. Maufe, the recently appointed Chief of the Geological Survey of Southern Rhodesia, is at Salisbury conferring with Sir William Milton, the administrator, on the question of whether the survey shall be commenced in the Matabeleland or the Mashonaland province. Mr. Maufe has already made a preliminary investigation of the geological conditions around Bulawayo and Gwelo, but the systematic geological mapping of the country has not yet been commenced. The British South Africa Company's directors are, in addition to the Geological Survey, employing prospectors to exploit various portions of the company's territory, and it is anticipated that much valuable geological data and not a few important discoveries will result from these expeditions of research.

DAWSON, YUKON TERRITORY

Good Season Closed.— North Fork Power Co. — Methods of Excavation.—Boyle Concession.—Largest Dredge in the World.

The past season has been one of the most active that this district has witnessed, and at its close all work contemplated for this season was finished. This is rather unusual, since construction work nearly always extends over a longer period than planned. This is especially true in this northern country. A particularly notable undertaking is that of the North Fork Power Co. controlled by A. N. C. Treadgold, of London. The plant of this company will be supplied with water through a ditch six miles long tapping the North Fork of Klondike river at a point thirty miles from Dawson. The ditch when completed will deliver 20,000 inches of water under a head of 235 ft. and approximately 10,000 hp. will be developed. The plant will be of the latest design throughout and capable of supplying sufficient power for this district for all mining purposes. Construction is under the immediate charge of H. G. Boardman, who for the past four year was chief electrician for the Yukon Gold company. The ditch was excavated by means of two Thew steam-shovels in charge of David Elliott, a man of resource and long experience. Many difficulties were overcome, chief among which was that of disposition of the spoil, the ditch being large, 25 ft. wide on the bottom, 5 ft. deep, and with a slope of $1\frac{1}{2}$ to 1. The country through which the ditch passes is almost flat. A second and almost as serious difficulty was the presence of frozen ground at points throughout the length of the ditch. The former difficulty was overcome by raising the shovel arm to its full height directly opposite the piled-up material on the lower bank, and then extending the arm horizontally to its full length, the top dirt, being thus pushed outward by the bucket, made room for a new load. This operation was repeated as often as possible. This involved delay for the shovel, but in most instances proved satisfactory. Where this method would not suffice, a steam scraper of one half

cubic yard capacity was brought into play, but owing to the immobility of the device this method was not as satisfactory as the first where the latter would work. The frozen ground was overcome by the use of powder and by thawing. Where the latter was done steam was injected through pipes of ¾ in. diam. These 'points,' as they are called, are made of hydraulic steel pipe and have solid heads 6 to 8 in. long welded on the upper end. Immediately below this head and at right angles to the pipe a nipple of smaller diameter 3 to 4 in. long is inserted. The other end of the point is sharpened by drawing the pipe together until only a small opening remains through which the steam may pass. To the nipple is connected a steam hose of suitable length which is attached to the supply pipe. These points are made in lengths suitable to the depth of ground to be thawed. They are placed in a vertical position and the steam finds its way through the point to the frozen material, which it quickly thaws. The point is then driven down by tapping with a hammer on the solid head until the desired depth is reached. It is then allowed to 'sweat,' as it is termed, for several hours, according to the character of the deposit, after which it is drawn up and the operation repeated elsewhere. As many points as desired may be used. They are placed 8 ft. apart and are supplied with steam by a systematic distribution of parallel lead pipes. Approximately one horse-power boiler capacity is required per point. The elevation at the intake of the North Fork ditch is not more than 500 ft. above the general mining field, and as a result the plant will run during the entire open season, the freeze-up at plant and mining field occurring simultaneously. Where the elevation of the intake is considerably greater than the point where the electricity is employed, the open season is necessarily shorter, and power is cut off a week or two before mining would otherwise have to stop. In the spring power may be delayed an equal length of time. The Yukon district is fortunate in its power possibilities, as the tributaries of Klondike river are capable of supplying more power than is likely to be required for a long time.

Another interesting feature of this year's work was the installation of a 15-ft. dredge, built by the Marion Steam Shovel Co. on the Boyle Concession. This dredge is the largest boat yet constructed, and will dig approximately 10,000 cu. yd. per day. The work of assembling this dredge is in the hands of Howard Brenner, who came from the Marion works for this purpose. He chose his workmen and mechanics from the men living in this country and was able to find skilled men for every class of work connected with the building of the boat. The transportation of machinery from Dawson to the point of construction on the Boyle Concession, a distance of seven miles, was no easy matter even over the excellent roads of the Klondike. Some idea of the magnitude of this dredge may be gained from the following weights: two spuds, each 27 tons; points of spuds, each 5 tons (a total spud weight of 32 tons) ; lower section of the bucket ladder, 17 tons; buckets (between 70 and 80 in number), each 4100 lb. The total weight of the loaded ladder will be 275 tons; the weight of tumblers, lower 5 tons, upper 7 tons, the latter carrying a 25-in. shaft; total weight of dredge, approximately 900 tons. This is the second dredge on the Boyle Concession. The first, a 7-ft. Marion boat, has been successfully at work for five years, and is still fit for long service. Both boats are electrically driven, and will have a combined capacity of 14,000 cu. yd per day for the entire season, which on this property is at least six months in the year, on account of unfrozen condition of the deposit. There are other things under way for the future, but at present little authentic is known of them. The great opportunities of the Klondike and Alaska are gradually becoming known, and it is to be hoped that they will be carefully exploited before investment. Thorough prospecting and preliminary work are most essential, and these investigations should be intrusted to competent men familiar with the unusual conditions. Much money will be saved and disappointment avoided if prospective investors will carefully investigate conditions before plunging into a region little understood by outsiders.

TORONTO, CANADA

Cobalt Discoveries.—Porcupine Mines.—Discoveries at Hoban.—Moose Mountain.—Nova Scotia Iron.

Recent favorable news from the La Rose mine brought the stock up to par again last week in a generally dull market. The reports have been fully confirmed as to the finding of a rich vein at the 170-ft. level, paralleling the main vein. It has been cut at eight points on the 157-ft. level and also at the 62-ft. level, and opened for several hundred feet in length. The average width is 4 to 5 in., and the ore assays nearly 4000 oz. in silver. Rich ore has also been struck at the 188-ft. level of the Lawson property. The latter discovery is regarded as of importance to the Hargrave mine adjoining, as Hargrave's No. 11 vein runs west toward the Lawson line. It is a strong vein, but has not been opened, operations being principally confined to No. 1, 2, and 3 veins, which have lately been yielding well. The mine is taking a good place among the active shippers. At the Beaver the main shaft and the winze are both down 300 ft. A cross-cut was recently driven on the 200-ft. level to open a vein cropping at the surface, which showed rich ore at a distance of 110 ft., and a good vein, 6 in. wide, of high-grade ore has also been found by cross-cutting on the 250-ft. level near the Temiskaming line. Seven drills are working double shift with a force of 80 men. A contract to sink to 400 ft. has been let. Foundations are being laid for an addition of 20 stamps to the Northern Customs concentrator which will increase its capacity to 200 tons of ore per day. The Townsite has made a contract with the company to treat 50 tons of ore per day. The bullion shipments from Cobalt are steadily increasing. The Provincial has found good ore at 175 ft., an adit at this depth being driven between two veins, each 2 or 3 in. wide and about 4 ft. apart. These veins have merged and show increased silver content. The Wettlaufer in the South Lorain area has a pay-shoot 126 ft. long at the 220-ft. level, yielding 4000-oz. ore.——Among recent visitors to Porcupine was William Frecheville, who after a brief inspection of the camp stated that he was satisfied that there were at least two coming dividend-payers among the properties undergoing development, and a number of highly promising prospects. Interests identified with the Dome mines have taken an option on the six Shillington-McIntyre claims in the Pearl Lake area. The purchase price is given as $400,000. The Davidson properties adjoining the Crown Chartered have been bought by an English syndicate.——Rich gold discoveries are reported in the neighborhood of Hoban, a point on the main line of the Canadian Pacific railway, 120 miles north of Sault Ste. Marie. William Norquist was the discoverer and located five claims before the news got out. There has since been a rush and many prospectors from Haileybury and Sudbury have gone into the country.——There is increased activity in the iron and steel industry. Numerous mergers and expansions of manufacturing enterprises have stimulated iron mining. The Moose Mountain Mining Co., which is working large iron-ore deposits at Sellwood, to the north of Sudbury, has decided to supplement the process of magnetic separation, now used in refining the ore, by the Gröndal process of wet separation. When the new plant is installed it is expected that their output of refined ore will be increased to about 1000 tons per day. The Atikokan Iron Co., of Port Arthur, will operate its furnaces all winter, instead of closing for the season as has hitherto been done. Railway communication will enable the company to obtain a steady supply of ore from the Atikokan mine. Sydney Davies, an expert from Newcastle-on-Tyne, England, is in Canada looking into the possibilities of securing a supply of Canadian steel for British manufacturers and shipbuilders. He has been examining the iron ore deposits of the Gatineau in the Ottawa district. Boring operations on the submarine iron ore areas of the Nova Scotia Steel & Coal Co., Wabana, have shown that the lower bed is 20 ft. thick and carries 3 to 4% more metallic iron than the other workings. This lower seam has been proved to extend about 3000 ft. into the company's area.

LONDON

Rio Tinto's Curtailment.— The Cobar Mines — New Tin Promotions

The directors of the Rio Tinto company owning the premier copper mine of Spain have issued the usual annual report. They announce an interim dividend of 2/- on the ordinary shares. A year ago the interim dividend was at the rate of 3/-, and the total dividend for 1909 was 6/-. The information relating to the intended restriction of the output of metallic copper is of particular interest. It appears that the demand for sulphur ore is greatly increasing, so, in view of the low price of copper, ore of lower copper content is now being mined. Thus less copper will be marketed, the decrease for 1909 being estimated at 4,480,000 lb. The directors note that this action on their part has had some influence on the American producers and they are able to forecast a general diminution in the production. As regards the profits of the company the directors indicate that they will be much less for 1910 than for 1909. The report also mentions that the work of removing the overburden is being hastened, and it is recorded that the recently increased reservoir capacity has enabled the mine and smelter to get through an unusually dry summer without any shortage of water.——The Great Cobar copper mine is one of the most important mining propositions in Australia. It yielded handsome profits for many years to local owners, and most of the London promoters cast longing eyes on it. The owners, however, wanted a high price, and wanted it in cash, so that it was beyond the reach of most of the proposers. Eventually a group of financiers consummated the deal, and an English company was formed in 1906 to acquire the property. The purchase price was £800,000 in cash and £206,000 in shares and debentures. J. D. Kendall, C. M. Rolker, and W. J. Barnett reported on the property, and the first named became consulting engineer. The Lithgow refining works and the Chesney copper mine were also purchased. The company proceeded to erect modern blast furnaces, and large sums were spent for the purpose. Unfortunately, the design was not adapted to requirements, and in a great number of ways the working of the plant broke down. G. H. Blakemore, the manager, resigned, and subsequently J. D. Kendall followed suit. H. C. Bellinger of Montana was appointed manager at the beginning of 1909, and, being a skilled copper metallurgist, he has been able gradually to rectify the faulty construction. The report of the company for 1909 has just been issued, its appearance having been delayed by the disarrangement of operations caused by the Australian coal strike, which stopped all work at the beginning of November of last year. The directors, however, issued concurrently an interim report, bringing information up to date, and at the meeting of shareholders held on October 12, the present position was still further elucidated. The mistakes in the design of the plant, together with the coal strike, have cost the company large sums of money, which have been provided out of revenue. Owing, however, to the imminence of the time when £100,000 a year has to be provided for the redemption of debentures, the directors have considered it advisable to recommend the creation of 30,000 new shares of £5 each and to hold them in reserve in case it might be desirable to issue some of them in exchange for debentures. It should be recorded here also that, four months ago, the property of the Cobar Gold Mines was absorbed. This was an important move, for it gives the company a liberal supply of silicious flux containing 10 dwt. gold per ton in place of the barren flux which has hitherto been purchased and hauled from a considerable distance. During the ten active months of 1909, 163,449 tons of Cobar ore and 40,928 tons of Chesney ore, together with 42,718 tons of 'returns' were smelted, and the amount of metal shipped was 5072 tons copper, 14,452 oz. gold, and 83,207 oz. silver. The most recent news is that the smelter and mine are now in a position to produce and treat 40,000 tons of ore per month and produce 850 to 1000 tons of copper. The ore reserve on August 31 of this year was 2,877,000 tons in the Cobar and Chesney mines averaging rather under 3% copper, figures showing a large increase over those of December 1 last, as well as a considerable addition of gold ore in the Cobar Gold mine. The main shaft at the Cobar is 1150 ft. deep and a level is being opened at 1100 ft. where the ore is as good as anything above. It is intended to sink further and start levels at 1400 ft. and 1650 ft. Diamond drilling shows that the lode in several of the levels can be worked profitably to a greater width than was at first supposed. The accounts at December 31 showed a profit of £73,938, out of which £41,940 went as debenture interest and £11,700 was devoted to filling some of the stopes with waste.——Attention has been attracted once more to the Briseis Tin company, which was floated in 1899 by the Venture Corporation for the purpose of acquiring tin gravel deposits in the northeast of Tasmania. The price paid by English shareholders was about ten times as much as the Australian intermediary vendor paid for the property, and the results have never come up to expectations. The company operates the adjacent gravels belonging to the New Brothers Home No. 1 Co., and receives 58% of the proceeds. In 1909, as the tin-bearing gravel was approaching exhaustion, the scope of operations was broadened and the words 'General Mining' were added to the name, at the same time options on gold-gravel properties in Victoria being obtained. The capital of the company is £600,000, and the total dividends to date amount to 46¼%. The report now issued covers the year 1909. It includes reports by the consulting engineers Lake & Currie, and by Lindesay C. Clark, the general manager. Concurrently an additional report by David Currie is issued giving the results of his investigation made two months ago. The report for 1909 shows that during the year 888,050 cu. yd. of tin-gravel and overburden in about equal quantities were removed, as compared with 1,115,300 cu. yd. in 1908, the decrease being due to the cemented nature of the gravel and the increased hardness of the basalt overburden. The south section at Briseis is practically exhausted and the No. 1 will follow suit shortly. The output of black tin was 1102 tons as compared with 1395 tons, the metallic contents of which were 808 tons and 1020 tons, respectively. Of the metallic tin, 767 tons came from the Briseis property in 1909 and 914 tons in 1908, the remainder coming from the No. 1. The Briseis company takes 58% of the produce of the No. 1 and pays 42% to the owners. The total income of the Briseis company for 1909 for the tin property was £105,953, and the expenditure at the mine £37,668. The directors report that the Wallace gold-gravel properties in Victoria were acquired during the year and that a third dredge has been built. Much preliminary work is being done and £22,409 has been spent on capital account against a recovery of £4437 in gold. After payment of London office expenses, taxes, etc., and allowing for depreciation, the balance of profit is £33,852, of which £20,000 has been carried to reserve and £15,000 distributed as dividends, being at the rate of 2½%. Since the end of the year the output of tin concentrate has been maintained at practically the same rate, and at the Wallace mine 252,890 cu. yd. yielded gold £3935. Mr. Currie's report states that the southern section of Briseis was exhausted in June of this year and that in the northern section, which as mentioned above consists of cemented gravel, there was in September a reserve estimated to contain at least 500 tons of black tin. No. 1 property was worked out in June. With regard to other resources, the borings at Krushka's Flat indicate the presence of over a million cubic yards of ground, some of which is old tailing, averaging 2½ lb. of black tin per cubic yard. The Ringarooma property presents many difficulties and work has not advanced far. It is proposed to strip one face so as to ascertain the general nature of the deposit, and its ultimate exploitation will have to be further considered. Mr. Currie estimates that during the next three years an output of 45 to 50 tons of black tin can be maintained from the northern Briseis and Krushka's Flat. Much interest now centres in the development of tin-bearing gravel mines in Nigeria, Africa, where a large tonnage of payable ground is said to be available.

MEXICO

Interesting Statistics.—Extensive Operations in Altar Placers. — New Oil Development.

A recently issued statement, covering in detail the foreign commerce of Mexico in the fiscal year 1909-10, shows that the exports of mineral products amounted to ₱156,520,917.84, or over 60% of the total. The year's exports had a total value of ₱260,056,228. The mineral exports of the last fiscal year represented a substantial increase over those of the preceding fiscal year, 1908-09, and a slight decrease compared with those of 1907-08. The totals for the two years were, respectively, ₱144,272,825.52 and ₱158,409,327.07. The statement also shows that the balance of trade between Mexico and the United States during the fiscal year was considerably in favor of this republic. While Mexico's exports to the United States amounted to $196,978,639.52, or 75.74% of the total exports, the imports from the United States had a value of only ₱112,878,362.06, or 57.93% of the total imports. In this connection it is interesting to note that while Germany sold Mexico products representing 10.35% of the total imports, Germany's purchases from Mexico equalled only 3.25% of the total exports. The corresponding percentages for France were

Mexico.

8.98 and 4.72, and for Great Britain 11.42 and 10.97. The lack of metal manufacturing in Mexico, notwithstanding the country's great mineral production, is brought prominently to public attention by figures showing imports of manufactured articles of gold, silver, and platinum to the value of ₱3,235,723.32, of copper to the value of ₱3,015,454.57, and of tin, lead, and zinc to the value of ₱706,797.15, a total of ₱6,957,975.04.——Equipment capable of handling, according to estimates, up to 5000 tons of dry-placer material in 24 hours will be installed by the Neill Development Co. of Spokane, Wash., at the Palomas placers in the Altar district of Sonora. The company was formed early this year. The equipment will include 8 Quinner pulverizing machines, tables for dry concentration, and a complete system of belt conveyors for handling the cemented gravel and tailing. The plans, which have been prepared by Los Angeles engineers, call for the erection of an electric-power plant at the coast and the transmission of current 27 miles. The conglomerate will be carried to five Quinner machines for disintegration, the product passing to dry concentrators, and later the tailing will be reground in three Quinners and reconcentrated. Several areas of cemented gravel are included in the company's holdings. The one to be worked first has an area of 3,000,000 sq. ft. and an average depth of 50 ft. Within the last 60 days titles to a number of important placer denouncements in the Altar district have been issued, and plans are in progress for the equipment of some of the properties with pulverizing and dry concentrating plants. The denouncements were made early in the year.——Mine water is to be utilized by the Tajo Mining Co., of New York, operating in the San Sebastian district of Jalisco, in the generation of electric power for mining and milling. The company is driving a long adit to cut the old Tajo vein at depth, and is now in 2200 ft., and through this adit much water is flowing. It is to be carried in iron pipes of 10, 11, and 12 in. diam. for a distance of 3000 ft., and will operate Pelton wheels under 600-ft. head. It is estimated that the volume is sufficient to generate 250 hp., enough for the company's mining and milling requirements. The pipe and power equipment are on the way to the mines, 100 miles distant from the railroad at San Marcos. The company is increasing the capacity of its concentrating and cyaniding plant to 120 tons daily.——The transmission of power to the Etzatlan and Hostotipaquillo districts of Jalisco will be commenced shortly before the opening of the new year, according to the latest estimate of the Chapala Hydro-Electric & Irrigation Co., of Guadalajara. Pending the completion of its new plant, power will be supplied from an old plant at the Juanacatlan falls of the Santiago river, and the transmission will be at 30,000 volts. At this voltage the loss is expected to reach nearly one-third, but the company is willing to stand it, particularly as penalties to mining companies for failing to deliver power more than a year ago will be stopped. With the completion of the new power plant the transmission will be at 70,000 volts. In connection with the important Mines Company of America-Dolores-El Rayo merger, it is now explained that the properties of the La Dura Mining & Milling Co. in Sonora, taken over some months ago by the Mines Company, will be held equally by the three merger concerns. Payments of $400,000 have been made on the La Dura properties out of the earnings of the three companies. The reduction plant of the La Dura is being overhauled, and new equipment will be installed. Telephone lines connecting the plant with the Gloria and Prieta mines are being built. It is stated that the Mines Company of America is planning to increase its milling capacity from 9000 to 16,000 tons per month. A report of the Dos Estrellas Mining Co. for the five weeks ended October 1 shows a production of ₱1,189,908.54. The expenses for the period were ₱390,220.24, leaving a profit of ₱799,688.30. The ore milled totaled 43,545 tons, and shipments of 73 tons of rich ore were made to the smelter. In October the Dos Estrellas paid dividends of ₱4.50 per share, a total of ₱1,350,000.

SALT LAKE, UTAH

Utah Copper Co. Curtailing. — Daly West's Quarterly Report. — Litigation Compromised.

The quarterly report of the Utah Copper Co. shows a production of 23,194,921 lb., a monthly average of 7,731,640 lb., which is about 2,000,000 lb. less than the preceding quarter, due to the curtailment of production inaugurated August 1. The average copper content of the ore during the quarter was only 1.5%, and for September 1.4%. The cost of production was 8.23c. per pound against 7.53c. for the preceding quarter. This increase in cost was due to the smaller production and the lower grade of ore treated. The total net profit for the quarter was $1,329,966.88 and the dividends paid $1,168,882.50. About 83% of the ore was mined by steam-shovels and the remainder by underground methods. Four shovels are stripping the ground acquired from the Boston Con., but it will be some time before this portion of the property will be ready for steam-shovel mining. The alterations in the Magna plant have been completed and it now has a normal capacity of more than 10,000 tons per day. Alterations have been commenced at the Arthur plant, which is, in consequence, operating at only part capacity. It will be about the first of the year before any of the remodeled part of this plant will be in operation. Grading on the open work of the Bing-

Lake & Overland railroad is nearly completed, and connection between the Mining camp and the San Pedro railroad will be finished by the end of the year. The tunnels at the Bingham end of the line will be driven during the winter and should be completed by April, so that the company will be shipping over its own line some time during the second quarter of 1911. The report of the Daly West for the third quarter shows a net profit of $34,234.1, against which is dividend No. 32 of $54,000, so that there is a debit of $19,765.87 in the cash balance for the quarter. During September the mill was closed down except for one shift, owing material falling off in receipts. It will be operated on this schedule indefinitely, and the report states that owing to the large amount of development being done actual operating expenses will not be met under these conditions. The ore opened up on the 1900 ft. level proved to be richer than that on the 1700 and 1800 ft. levels, but was not found in the quantity expected. Unless something unforeseen occurs, it is reasonable to suppose that Daly West has paid its last dividend for some time to come. In the suit of the Uintah Treasure Hill against the Silver King Coalition, a stipulation has been filed which provides for the sale of the twelve claims in dispute. The claims will be sold individually at public auction and the proceeds will be apportioned by the court when the suit is decided. The Uintah Treasure Hill claims an undivided two thirds interest in the property and asks that it be reimbursed for $28,700 spent in developing it. This company has levied an assessment of one cent per share. Colorado has made a find in almost unexplored ground. A drift sent out on the 300 ft. level cut ore near the Sioux Con. end line. While the discovery was made near the boundary line, the supposition is that the vein is overhead and that the ore will make back along the drift. The Sioux has worked out its portion of the vein at this place, so that this development will not affect the latter company. Beck Tunnel has levied an assessment of one cent per share. The Rainbow mine, in Mormon Basin, Idaho, owned by the Commercial Mining Co. has been bonded to the United States Smelting, Refining & Mining Co. for $1,050,000. By the terms of the agreement the United States company has four months in which to make an examination, and if it then decides to take over the property, will make a cash payment of $250,000. At the annual meeting of the South Utah, F. A. Schirmer was succeeded on the directorate by Hugo Hoffsteadter, and L. A. Kramer by Samuel Newhouse. No report was issued, as the first unit of the remodeled mill only went into operation September 1, and the second unit September 16. Up to October 21, 730 tons of concentrate was shipped to the International smelter at Tooele, but the management is expecting to produce 1000 tons per month. Since the reorganization the mill has been remodeled and the company has $200,000 working capital in the treasury. An attempt is being made by Salt Lake and Los Angeles capitalists to organize an independent smelting company.

NEW YORK

Politics and the Market.—Copper Production.—New Mill for Alaska.—Cerro de Pasco.

Political possibilities were potent market factors before the recent election. Wall Street's desire to repudiate Mr. Roosevelt has been so fully gratified as evidently to somewhat overawe the very interests who were loudest in demanding his defeat. It is as yet too early to estimate the market effect of the political landslide, though it is apparent that there is no pent-up 'bull' enthusiasm to be liberated.

In the mining market there is much to overcome. Mining-share operations have left a multitude disappointed, angry, and bewildered. There have been too many campaigns carried on with consummate skill, ending in approximately total losses; too many of the type of Ely Central, Cobalt Central, Nevada-Utah, Trinity Copper, and a host of other specific instances, to say nothing of the great public, which got into the cheaper Goldfield issues, and who for the most part is not aware of [illegible] obtained at bottom prices. [illegible] the [illegible] advertising campaigns there [illegible] lation of the public some idea of the value of the right kind of publicity, some idea of mine valuation, [illegible] requirements and management rather than an angry sense of loss and a complete refusal to regard the mining industry in its true light; then perhaps the losses suffered will be cheap experience in the end. — The Copper Producers Association's figures covering the month of October were satisfactory, though the result was attained in rather unexpected fashion. Following a decrease in foreign accumulated stocks during October of 12,407,360 lb. the decrease in surplus in this country was 9,531,800 lb., cutting down the world's supply by 21,939,160 lb. to 337,427,194 lb. The unexpected element was the increase in production, which for the month totaled 126,469,284 lb., a figure exceeded but twice during the current year. The situation was saved by the consumers, who took 136,001,984 lb., 67,814,172 lb. for domestic use, 68,186,912 lb. for export. The figures are rather disconcerting for those who have been crediting the betterment in copper to an understanding among the large producers. In October and November it was expected that the refinery output would begin to show the effect of restriction. November figures will, therefore, in view of last month's output, be looked for with some anxiety.— Utah Copper costs continue to exceed those of Nevada Consolidated materially. The report for the quarter ended September 30, shows an average cost of 8.25c. per lb. against a cost of 7.05c. for Nevada. The average monthly production was 7,731,640 lb. of copper. Net profits for the quarter were $946,026, in addition dividends received from the Nevada Consolidated were $371,730, making a total net profit of $1,329,967. Four steam-shovels are stripping on the Boston Consolidated ground and three more are to be started as soon as possible.— — The Tennessee Copper Co. is contemplating making a refunding bond issue. There are now outstanding first mortgage bonds to the amount of $350,000, and $600,000 in short-term notes. A special meeting has been called to provide for the issuance of $1,500,000 first-mortgage bonds to retire all of the outstanding obligations, the balance of the proceeds to go into the treasury. Tennessee Copper represents a total investment of nearly $12,000,000, of which about one-fourth has been expended on the acid plant.—— Ray Central is still in the market with its $2,000,000 bond issue. Underwriters are asked to take over the management of the property. During the time that Ray Central was under option to the General Development Co. the issue had a large active following. In the present situation, therefore, there have been a number of irresponsible market sharpshooters endeavoring to secure an underwriting of Ray Central, with the hope of scalping trading profits in a manipulated market.——Ely Central, selling but a short time ago at $4 per share, is in the throes of reorganization. It is proposed to shareholders to form a new company, of which one share of stock is to be exchanged for one share of Ely Central and 25 cents. This assessment is considerably more than the present price of the stock. The house of Scheftels & Co., recently raided by Federal authorities, is said to have heavily oversold Ely Central and to have been short a large amount of stock at the time the authorities descended upon them. It is believed the same interests, in the hope of defeating prosecution, are now engineering the present move in the hope of eventually doing something with the stock in case they can get on their feet again.——The California Nevada Copper Co., which is erecting the big mill on the Ebner gold mining property, near Juneau, Alaska, has purchased the entire capital stock of the Humboldt Gold Mining Co. The property consists of 32 acres of ground on both sides of Gold creek, on which some development has been done, and a 5-stamp mill built. The ground was particularly desired by the California Nevada, as, by the purchase, the latter acquired complete control of the water-power on Gold creek, where 3000 hp. can be developed.

COLORADO SPRINGS, COLORADO

Taxation.—Coal Mine Disasters.—Clear Creek Mines. — Drainage at Cripple Creek.—Treatment Rates.—An Important New Coal Company.

Political issues have so occupied the public mind and press that the industries of the State have remained almost unnoticed. The Colorado branch of the American Mining Congress took occasion recently to express its dissatisfaction with the present system of taxing mining property. It was an opportune time to bring forth such a discussion, as legislators seem more attentive to the wants of their constituents before than after election. It is a fact that some properties that are struggling along, barely on a paying basis, are burdened by a tax levy on gross production instead of net income.——Two serious coal-mine explosions have occurred during the past month in the Trinidad field. The first, on October 9, was at the old Starkville mine, five miles southwest of Trinidad. This property is one of the oldest and most extensive in the district. It is operated by the Colorado Fuel & Iron Co. The mine was badly damaged by the explosion and 56 men were killed. The State Mine Inspector has reported poor ventilation and an accumulation of unsprinkled dust in the main haulage-ways. Exactly a month later the No. 3 mine of the Victor-American Fuel Co. at Delagua was wrecked by a terrific explosion which caved the main slope for several hundred feet. This explosion is believed to have been caused by a fire which broke out in the old workings. At last reports 81 men were believed to have perished in this disaster. Heroic work on the part of the crews of the C. F. & I. rescue car and of the Bureau of Mines car, which had arrived in Denver less than a week before, was responsible for saving several of the entombed miners. As one observes the elaborate precautions taken to rescue men after an explosion, he wonders if equal precautions are being exercised to prevent such accidents.——Rich finds and heavy shipments are reported from all the metal-mining camps of the State. Leadville has largely increased its tonnage by shipping the zinc ores recently discovered in many of its old mines. The new camp of Beshears, near Georgetown, claims a mine in the Esconado which has shipped a ton of $82 ore to the sampler at Georgetown. A few of the companies are laying in supplies for winter development. The Malm dry-chlorination plant is still incomplete and many are becoming impatient at the repeated delays. With this plant not yet ready for business and the Modern smelter at Utah Junction sold under foreclosure, the producers in the upper Clear Creek district are left with only the Golden and Denver plants to choose between.——The Cripple Creek deep drainage adit has begun to benefit the camp. The drill-hole from the bottom of the El Paso shaft to the lateral from the tunnel was finished on November 5. The lower workings of the mine have since been slowly draining. The breast of the adit is now very wet, and the main watercourse may be broken into at any round of holes. In the latter part of September the U. S. R. & R. company announced a cut in treatment rates on low-grade ores at the Colorado City plant. The Portland company immediately met the rate. The Golden Cycle plant did not attempt to meet the rate and has lost some low-grade ore as a result. Now the Portland management announces that its old rate will henceforth be in effect, as there is no profit in treating the ore at the lower figure. The production from the district for October was 68,775 tons having a gross bullion value of $1,427,275. The proposed aerial tram from the Golden Cycle mine to its mill in Colorado City is still under discussion.——A new company which rivals the C. F. & I. in the scope of its proposed operations has been incorporated by J. D. Milliken and associates. It is known as the Colorado & Wyoming Coal Co., and is capitalized at $6,000,000. The company will operate in Adams, Weld, Larimer, Huerfano, Fremont, Las Animas, and Routt counties in Colorado, and in Albany, Carbon, Natrona, Converse, Big Horn, and Uinta counties in Wyoming. Its incorporation papers permit it to engage in mining and the sale of coal, the manufacture of coke, and the building of smelters.

BUTTE, MONTANA

Anaconda Buying New Property.— Extensive Improvements Unper Way.—Copper Output for October.

The Anaconda Copper Mining Co., within the past few days, secured several properties by purchase which includes the Old Glory, a developed mine in Centerville district, through the purchase of a seven-twelfths interest, the company having secured five-twelfths when the Trenton and Red Metals companies were purchased. The Old Glory lies between the Snoozer and Raven mines, having been located on a northwest and southeast discovery vein, while the Snoozer and Raven are east-west locations. The Old Glory has produced some ore. The Anaconda company has also purchased the Emily and Millview lode claims lying just north of and adjoining the Badger State and Auraria claims of the Anaconda company. The Anaconda company is also developing the Badger State mine, formerly one of the Boston & Montana properties, and reports are that an important copper vein is being opened on several levels down to a depth of 1800 ft. In addition to the Emily and Millview, the Anaconda company has bought from the Largey estate the Polly lode claim, a half interest in the Torrid, one-half interest in the Tropic, five-twelfths in the Maud & May, and one-eighth in the Sioux Chief, all fractional claims lying within groups of the Anaconda company properties. The Sioux Chief lies just south of and adjoins the Tuolumne.——The Heinze Basin Reduction Works is having some trouble as a result of the $145,000 claimed by the State Savings Bank as long overdue on a note. The Sheriff of Jefferson county, in which the property is situated, has attached the millsite of the company, water rights, and improvements, and the Katie, Kissing-Bug, Canyon placer, and Klondyke placer claims. The note was signed by the president and treasurer of the Basin company.——The Butte Central Copper Co. has commenced sinking the shaft 500 ft. The property consists of the Ophir mine which is now down 500 ft. Men are at work on the several levels between the surface and the 500-ft. level. ——Expensive improvements are being made by the Anaconda Copper Mining Co. It will cost over $1,000,000 to install the electric system and the air system to operate the hoisting engines. Compressed air will be used in the engines instead of steam. Twenty-five air receivers, each 30 ft. long by 10 ft. diam., have been installed with a dozen huge compressors, in a building more than 300 ft. long, sufficient air storage to hoist every man in the Anaconda mines in the event of accident to compressors or suspension of the electric current. In conjunction with the air-compressor plant a water tank has been erected which is 100 ft. diam. and is built entirely of steel.——According to advices from Wallace, Idaho, Heinze's Stewart mine has augmented its output and the force has been increased to 125 men. According to report, 1000 tons of concentrate has been turned out monthly by the Wallace mill, at a net profit of $15,000. This was accomplished working one shift. A second shift has been added and the daily output of ore increased to 280 tons and the monthly output to 1200 tons of concentrate.——Butte & Superior stock is still almost stationary. The mine is shipping ore daily to the Basin concentrator, with good results, and it is understood that the company is more than making all operating expenses. The Butte & London Mining Co.'s special meeting, held to consider the raising of money to meet an indebtedness by mortgaging the property to the extent of $10,000, and also for the purpose of selling the mine if deemed advisable, adjourned without taking definite action. Interest still centres in the recent find in the East Butte mine, which is said to be even more extensive than at first reported. On the 800-ft. level the vein has been cross-cut and at the point of intersection the orebody is 40 ft. wide and runs better than 10%. The report of the Copper Producers' Association for October showing a decrease of only a little over 900,000 lb. came as a great surprise to the mining people in this city, as it was expected from all reports of sales and continued curtailment, that the decrease would be fully equal to that of September.

General Mining News

ALASKA

(Special Correspondence.) A renewal of operations is in progress at the Rush & Brown mine, Ketchikan district, and stripping will soon be under way after having been closed down for several years. —The Wakefield, Lents & Powers property at McLean's Arm is being developed by Mr. Lents. The ore-zone has widened and is thus far persistent in depth as well as in strike. —The 11 mine bunkers are blockaded with ore ready for transportation to the Tyee smelter. —Development at the Dean prospect, Karta bay, has opened a fine body of gold-copper ore. —The Lon. De Van M. & M. Co. is in over 700 ft. with the cross-cut adit. The ore carries lead and zinc high in silver. —At Hobart some development is being done. It is the intention of the managers to install at 10-stamp mill on the Valparaiso property early next spring.

Ketchikan, November 4.

ARIZONA

GILA COUNTY

(Special Correspondence.)—The local management of the Little Miami Copper Co. has been instructed from the New York office to renew sinking of the inclined shaft on the Cole group of claims which was purchased from the Cole Development Co. last spring. The shaft is already 400 ft. deep and has run through high-grade copper ore in a vein 35 ft. wide. Richard Fleming, of Globe, is general manager. —The management of the Superior & Boston Copper Co. is daily expecting that the north drift on the eighth level will open the Great Eastern vein. The ground in the face is much broken and the presence of copper stain indicates that an orebody is near.—The Arizona Commercial Copper Co. has been made defendant in a suit for $15,000 damages by the estate of Morty McGinley, a pumpman and former employee, who was killed in the Eureka shaft about one year ago. The plaintiff asserts negligence on the company's part in not having properly secured the pump which fell on the workman.—Churn-drilling on the property of the Inspiration Copper Co. indicates that the low-grade orebody is at least 3800 ft. long, 200 ft. thick, and varies from 300 to 1200 ft. in width. The contour of the ore is very irregular, so that an estimate of average width is difficult. The copper content is about 2%. Two drills are in operation, continuing the prospecting. The connection between the Joe Bush and Scorpion shafts has been completed, and with 100 ft. more of driving the Colorado shaft, 2500 ft. west of the Joe Bush, will be connected with the other two. In the 75-ton test-mill a series of experiments has been commenced to determine the adaptability of the ore to concentration. T. R. Drummond, the manager, is employing 200 men.—The Arizona-Colorado Copper Co. has 200 tons of ore averaging 4% copper in the dump. Ore extraction is continued on the eighth level. The cross-cut to the vein on the second level is cut 25 ft. and should reach ore within 5 ft. of the present face. John F. Shaw is manager.—The secretary of the Lost Gulch United Mines Co. is expected in Miami and shortly after his arrival it is probable the 10-stamp mill will be put in operation. The company has 70 tons of gold ore in the bins and about 450 tons in the dump. The vein is exposed for a long distance in the workings and affords plenty of stoping ground. Lack of water has delayed milling hitherto, but the management estimates that sufficient water for treating ore can be obtained as soon as the annual rains begin. J. T. Harrington is president and is in charge of the property.

Miami, November 12.

YUMA COUNTY

(Special Correspondence.)—Work is to be resumed on the Planet mine, near Bill Williams fork and 12 miles from its confluence with the Colorado river, in the northern part of the county. This mine was operated until recently by the General Development Co., which holds one-third of the outstanding stock in the company owning the property. The new work will be undertaken by the old company and will be devoted principally to developing the orebody on the 150-ft. level from the vertical shaft. This shaft is over 600 ft. in depth but the lower levels are under water. The oxidized orebodies show a high content of copper.

Parker, November 12.

CALIFORNIA

EL DORADO COUNTY

(Special Correspondence.) Developments at the Good Luck mine are progressing vigorously. The south shaft is 160 ft. deep and is connected at the 60-ft. point with the north shaft, which is down 60 ft. The vein is tapped at a depth of 106 ft. by an adit. It is a well-defined ribbon vein, and has been opened about 400 ft. The mine is equipped with a 5-stamp mill, concentrators, compressor, and steam hoist. Eighteen men are employed. R. Mitchell is superintendent. —Operations have been resumed at the Vernon property, adjoining the Union mine, south of Placerville. It is said that a steam hoist will be installed. Developments have been commenced at the Leap Year. —Promising ore is being opened at the Encinal, and developments are going forward steadily. —San Francisco people recently took over the Starkey mine and have put men to work. There are a number of gold-bearing veins on the property which will be opened.—At the Stillwagon the mill is running on rich ore. —Work has been resumed at the Independence.—A full crew has been put on at the Lady Edner and Borealis group. If developments justify, the owner plans to install a milling plant early next year.

Placerville, November 11.

INYO COUNTY

(Special Correspondence.)—The Skidoo Mines Co., operating on the southwestern slope of Tucki mountain, Panamint range, recently shipped gold bullion to the value of $10,660, the result of operations during the last 15 days of October. This represented 780 tons of ore, the average recovery per ton having been $13.66. In addition, about $2.50 per ton is being recovered from the tailing, bringing the recovery to $16.10 per ton. Less than four hours was lost in mill work during the 15 days. Fifty men are employed in mine and mill, and from 40 to 50 tons of ore are being mined per day.

Skidoo, November 10.

SHASTA COUNTY

(Special Correspondence.)—The Balaklala Copper Co. has 35 miners at work in the Balaklala mines, and will increase the force. The Cottrell fume-controller is proving satisfactory and two furnaces will soon be in operation. The company is handling custom ore from the Bully Hill copper mines and numerous siliceous gold ore producers. —At the Afterthought 18 men are working. Retimbering of the workings is going ahead, and considerable development being done. The charges against the management in St. Louis have not, thus far, affected work at the mine.—It is rumored that the Mammoth Copper Co. may install a Cottrell fume-controller at Kennett.—The Shasta Copper & Gold Co. has a small force on development. It is expected shipments will commence as soon as the company has perfected its patents.—Promising deposits of copper ore have been found at the Kent property, and a small crew is pushing development.—At the Vulcan good ore is being developed.—The Monarch is about to enter the shipping list. Over 100 tons of $24 ore will be sent out shortly. The ore carries gold, but shows little copper. —A small force has been put to work in the Uncle Sam mine. An attempt will be made to find a rich shoot which is believed to exist near the main workings.—At the Clipper fair-grade ore is being opened.—A number of small gold mines are showing renewed activity with the resumption of work at the Coram and Kennett smelters. —The mills of the Midas and Victor companies narrowly escaped destruction in the fire which swept Harrison Gulch November 6.—The Noble Electric Steel Co. expects

to resume the production of pig iron at its Heroult plant as soon as the Northern California Power Co. completes the enlargement of power facilities.

Redding, November 11.

SIERRA COUNTY

(Special Correspondence.)—At the mines that will be run during winter, work is being rushed to get everything in shape. Three 10-horse freight teams are making weekly trips with freight from Truckee in addition to the regular freighting outfits. The Sierra Buttes mines are installing a 10-drill Ingersoll-Rand compressor below the upper mill. The air-pipe is laid into No. 6 adit where extensive stoping and development are to be done. A winze is being sunk on the pay-shoot in No. 6, and a hoist is to be installed. The air-drills will be running by December 1. Ten stamps of the upper mill are dropping on ore taken out in development. Jay C. Folsom is superintendent.——S. J. Van Seyckel has given up his bond on the Hayes Consolidated, two miles south of Sierra City, and has taken a lease and option on the old Keystone mine adjoining the Hayes mine. The main adit is being driven ahead by machine-drills. The power-house and equipment have been overhauled and two shifts are working in the face. Ten men are employed, and William Barker is superintendent.——The 10-stamp mill of the Clipper is running with two shifts, and another shift will be put on. The mine has been opened by development and stoping is in progress. L. W. Holley is superintendent.——Richard Phelan of San Francisco has had men working on the water-rights and on the lower adit of the Butte Saddle mine. He has just sold the mine to George W. Aldrich and associates of New Jersey, who will take control and put on a large crew. The lower adit will be driven to cut the vein and the tramway repaired. ——The lower tunnel at the Colombo is in over 300 ft. and is in the lode formation. It is expected to reach the vein in another 40 ft. The new boarding-house and blacksmith-shop have been completed. C. R. Thompson is manager and John Thomas foreman.——The Primrose mine in Hog canyon, owned by Du Ray Smith, has been closed down for the winter.——C. R. Thompson, who has a bond on the Monarch mine in Ladies canyon, has closed down that mine and discontinued all work on the property.——The Trompetto Bros., of Sierra City, are developing a rich vein on their property northeast of Sierra City.——Many engineers and investors have been making examinations of mines in this vicinity the past month and the outlook for the camp is bright.

Sierra City, November 9.

TRINITY COUNTY

(Special Correspondence.)—D. F. MacDonald of the U. S. Geological Survey is investigating the geological features of the Headlight and other mines of this district.——Rose & Chapman have opened and are developing a 10-in. vein of gold-telluride ore in the Coffee Creek district.——Henry Carter, Joe Fifer, and John Mackay have taken a sublease on the Dorleska.——Jack Lytle and Bert Haskins have taken a three-year lease on the Patrick Holland hydraulic mine on the east fork of Coffee creek.——Anton Larson and Albert Anderson, former lessees of the Altoona cinnabar mine, have a cinnabar prospect two miles north of the Altoona on Crow creek, a tributary of the east fork of Trinity river, showing a 12-in. vein. They are making preparations to drive a 150-ft. adit to develop the vein.——Angelo Belli & Sons, who are operating on the Scorpion, a tributary of Trinity river, recently took out gold from two pockets on their Young group that exceeded $5000 in value. The pockets were 20 ft. apart and were found in a 10-ft. quartz vein running between porphyry and serpentine, and carrying abundant sulphides. Some high-grade ore was also taken from the veins. The Bellis will move their 5-stamp mill to the new mine in the spring.

Carrville, November 15.

TUOLUMNE COUNTY

(Special Correspondence.)—At the property of the United Mines Corporation, situated two miles northeast of Tuolumne, and comprising the Dead Horse, Eureka, Lady Washington, Grizzly, New Albany, and other claims of less note, underground operations are confined to the New Albany mine. On the 700-ft. level a winze has been sunk 200 ft., from the bottom of which drifts are being driven north and south. The north drift is expected to open a shoot of high-grade ore within 50 ft. from the point of beginning. The one to the south, which is now 30 ft. long, will be driven an additional 120 ft., where it will intersect a cross-fissure which in the upper levels has invariably been accompanied by high-grade ore. The winze will be sunk 200 ft. deeper. Both drifts and the winze are in medium-grade ore 12 ft. wide, with occasional rich spots. The mill is operated one shift on ore extracted in development, but preparation are being made by the superintendent, J. M. Elmer, to begin stoping to keep the mill running night and day. The plant consists of 20 stamps and two Hardinge conical tube-mills, and has a capacity of 120 tons daily, a 6-mesh screen being used. Amalgamating is done in the batteries and in the tube-mills. Tailing assays show that only 40c. per ton is lost. The crew at present numbers 36 men.——A large amount of development work has been done at the Rising Sun, near Arastraville, during

New Albany Mine and Mill, Near Tuolumne.

the present year, and it is the intention to start the mill in the near future. It is expected that the body of rich ore found on level No. 1 will be opened before long on No. 2 level, which is 300 ft. below surface.——The mill at the Wickham mine has been started by the bondholders to make a test run. If the test shows satisfactory results, work on a large scale will be commenced forthwith. The development thus far consists of a cross-cut adit which reaches the vein 100 ft. below surface and two drifts, each being 100 ft. long. The property is owned by W. P. Huston and is situated near the Rawhide.——It is expected that the bed of gravel toward which an adit is being driven at the Leap Year mine, southwest of Jamestown, will be opened within a few days. Work is in progress night and day, eight men being employed.——J. L. Witney, of Los Angeles, has taken a bond on the Water Lily mine, near Bostick Bar, on the Stanislaus river.——The old Buchanan mine, four miles southeast of Tuolumne, which has not been worked since 1893, has been bonded and will be reopened.——It is reported that work is shortly to be resumed at the Santa Ysabel, near Stent, in which B. C. Austin and J. S. Bagg, of San Francisco, are interested. ——The Ida Klein mine, near Stent, under bond to the company operating the Mazeppa, of which Louis H. Bedding is manager, is to be worked on a larger and more practical scale. The result of the mill test recently made was equal to expectations, and it has been decided to buy a 20-stamp mill. It is understood that a substantial payment has been made on the property.

Tuolumne, November 11.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.)—The deal for the transfer of the Santiago mine in East Argentine district may be consummated the coming week, after which the property is to be turned over to the North American M. & S. Co., the consideration to be $500,000.——Work will begin this week

on the development of the Ramsdell property on Lincoln mountain. The crosscut is to be driven 300 ft. farther to intersect the series of veins, the first being the Golden Jack, said to be 40 ft. wide. — Good headway is being made in opening the McKinley property. The workings have been cleaned out and retimbered. — Since work was begun at the Vidler adit two months ago the big bore has been advanced 250 ft. — A streak of ore 3 in. wide has just been opened in the east drift of the Aetna vein, samples running as high as $400 per ton in gold and silver. Mr. Brady, the manager, has increased his force of miners. Shipments of smelting ore are being made, the average value being $60 per ton in gold and silver.——Ira Clapper, working a lease below the 240-ft. level of the Astor, has opened a 10-in. streak of smelting ore, assays of which show 350 oz. silver per ton. Some shipments are to be made. — Work was started last week in the development of the Spanish group situated on Columbia mountain. An adit is to be driven 100 ft. to cut under the upper workings where rich ore was mined a number of years ago.

Georgetown, November 10.

GILPIN COUNTY

(Special Correspondence.) — Five feet of solid ore is exposed on the west 13th level of the Topeka mine, in the Russell district. The streak of smelting ore is from 10 to 16 in. wide and runs 3.85 oz. gold per ton. H. P. Lowe is manager.——The Golden Slipper mine on Boulder creek is to become a shipper of ore from a 22-in. vein. — The Federal mine in Russell district has a body of mill ore 4 ft. wide. A shipment of 70 tons was sent to the Iron City mill last week. — Henry Baer has opened a 14-in. streak of ore on the St. Helena property that contains free gold.——Robert Davis, a lessee on the Topeka mine, is shipping ore that is said to sample 2.60 oz. gold per ton.——The 250-ton concentrating mill for the Topeka will be ready to operate within the next 30 days. In the meantime ore is being blocked.

Central City, November 10.

KANSAS

CHEROKEE COUNTY

(Special Correspondence.)—The Eureka company, representing one of the deepest developments in the district, is adding the output from the old Helen Hunt shaft on the land to the ore from the Eureka shaft, which is taken from 290 ft. and is found in a soft limestone and is difficult to separate from the ore. The ore from the Helen Hunt is from 150 ft. and is found in a hard flint matrix. It is the purpose to treat these two ores together, as they work to better advantage in this manner. A tramway is being built from the Helen Hunt shaft to the Eureka mill. A new shaft will be sunk on this lease. The mine will hencefortb be under the management of R. E. Baines.——The draining of the old Southside tract under the management of Franklin Playter has been successful and the upper workings can now be entered. This land was one of the early-day bonanzas, and there is still a large amount of ore in the shallow workings, as well as in the lower levels where it has scarcely been touched. The large number of shallow holes and drifts formed reservoirs to hold the water, most of the old shafts being filled to the surface. It was necessary in places to cut drifts to isolated workings to drain these portions of the ground. Many sub-lessees are now at work. In addition to the work on the South side tract, Mr. Playter has taken over the Cornwall and Palmetto tracts and has put them in order for production. He has remodeled the old Good Eye mill and will use it for a tailing plant for the Good Eye lease and others in the vicinity. A trial run resulted in the recovery of 2% ore. There is enough tailing in sight to last for two years. Development has been generally confined to above the 100-ft. level.——Members of the Mess Mining Co. have been inspecting their holdings. The mine has been in operation for several weeks, making large turn-ins. Mr. Savage, the manager, is also interested in the Quebradillas where a rich discovery of lead and zinc ore was made. The company is sinking from 63 to 190 ft., at which level a richer run has been discovered. — An Eastern company has installed a centrifugal pump for draining the Harvey tract and will make an effort to unwater the ground to 93 ft., where a 20-ft. run of ore is reported to have been found. Previous attempts to drain this land have not met with success.

MISSOURI

JASPER COUNTY

(Special Correspondence.) — There is much prospecting throughout the district. Particularly is this true in several of the camps on the outskirts, the Neck City field to the far north being especially important. Many successful capitalists from older fields have taken leases in this camp and are sparing neither expense nor effort to develop leases in this part of the field. They have been attracted by the remarkable finds and developments on the Quick Seven, Little Mary, and other tracts. The ore in this camp is unusually high grade. No camp ever opened in this district surpasses this for the length of time of operation. Among the newcomers are the American company, Ball & Gunning, Chapman & Lennan, C. E. Matthews, R. H. Van Hoose, and others, all of whom have been successful in the older fields, particularly the north Webb City sheet field. The ore in the Neck City camp is of the soft ground formation, and as the ore is rich and at comparatively shallow levels, and only a beginning has so far been made, great things are expected from this camp. — The Thoms Station camp, north of Joplin, is another field where operators are busy and where some rich finds have been made. ——J. M. Short, who has been prospecting the past summer and who has made many discoveries, has recently opened a new field on the Brinkerhoff land. The company is known as the Sitting Bull company and has found ore in nine holes, the first stratum being lead at 154 ft., and zincblende at 170 ft. which continued to 185 ft. A shaft is being sunk on one of the drill-holes which verifies the earlier record. ——The Federated, one of the most successful companies in the district, also has a lease in this vicinity, and it is the plan to drill the 40-acre tract of the Mexico-Joplin land. Two holes are down so far, ore being found from 128 to 160 ft. Below this there was rock for a few feet, when a second run almost 50 ft. thick was penetrated. The cuttings run from 3 to 24% zinc, with a small amount of lead. There is an old shaft on the lease down 130 ft., being 2 ft. into the ore deposit. This shaft will be deepened. Equipment is being placed for this work.——In the Carl Junction field, Charles Wells & Bros. have found ore on the Chitwood farm showing 60 ft. of lead and zinc, the ore being cut at 170 ft. Estimates of the drill clippings show 8 to 12% ore. The ore was found in four out of five holes, being at practically the same level and varying from 19 to 60 ft. in thickness. The 40-acre tract will be tested by 17 more holes. The ore is in hard ground, resembling sheet or disseminated formation. This farm, though in the mineral belt, is virgin, and from its situation and proximity to other producers, is promising.——Another camp which has been practically idle for some time and which is again coming to the front is the old Midway field northeast of Joplin. Here an effort is being made to drain the old Osyka lease by Dexter and Shirley. It was on this tract that Watkins and others made a successful fight against heavy water with a centrifugal pump, proving for the first time the efficiency of this type of pump for this district. It has since been in general use throughout the region. This camp is unusually difficult to drain owing to the nearness of the mines to Turkey creek, which overflows and floods the workings in wet weather. A steam-pump is employed at present and the water is being slowly drained and preparations made to reopen the old tract on the upper levels. When the ground is unwatered it will be possible for adjoining companies to go to work, among which are the Brattleboro, the Kaltan, Green Dog, Billy Sunday, and others. There is a 200-ton mill on the Kaltan lease and the ore occurs at shallow depth where the ground is soft and requires heavy timbering.——Another old camp rejuvenated is the John Jackson tract in Chit-

wood, one of the early famous bonanzas. The mine was thought to be exhausted, and abandoned years ago. Recently the St. Louis-Joplin company took over the land, and since that time the company and lessees have been prospecting and opening promising deposits. A mill has been moved from Zincite and rebuilt at the old John Jackson site. The ground is well opened and a face of ore available where ten machines could be set to work. The faces of ore are high and the dirt rich. In addition to this mill the A. B. C. mine on the same land is beginning the taking up of a 27-ft. stope below the 30-ft. face of ore already worked. Solid rich ore in large chunks has been taken out. The sinking of this shaft to a deeper level was difficult, owing to the inrush of water. Besides these two properties others have been opened on the John Jackson tract. There is a large amount of prospecting going on northwest of the Wilcox where the drill entered ore at 160 ft., continuing to 205. The cuttings are estimated to run 10%.——To the south of Joplin on the Matthes Bros. land there are several new mills. One is the 250-ton plant of the Jackson L. & Z. Co. which was removed from the South Webb City field.——In the same part of the field in Gordon Hollow there are two new mills, one built by the Niagara Falls company on a lease of the C. C. Playter land, which will make its initial turn-in this week. It is a 200-ton plant driven by gas-engine. One difficulty met is the scarcity of water. Pumps have been placed in two shafts and a pump line built to the old Puritan deep well to furnish a water supply. The ore is found at 80 ft. in two shafts and the dirt is said to run 7% zinc, with some lead.——Another new producer in the same part of the field is the Black Jack, named from the peculiar blackness of the ore which resembles lead ore. The ore from this mine, as well as others on the land, is cleaned at the Latshaw custom plant. Operations at present are conducted above 80 ft. and a face 17 ft. high is carried. Below this a larger body of ore has been discovered which is of lower grade and requires a mill before it can be treated profitably.

MONTANA

FERGUS COUNTY

(Special Correspondence.)—Earnings which would permit the payment of a dividend of $15,000 per month are being made by the Cumberland mine and cyanide plant at Maiden, according to James Breen, chief owner. The second unit of the mill has been in operation a month, 200 tons per day now being treated. Mr. Breen, speaking of the mill work, states that up to the end of September the heads had been running over $10 per ton, though they had not been breaking the full width of the vein. Beginning with October, the plan was to mine all ore running as high as $2.50 per ton, which will bring the heads down to about $6. The cost of mining and milling is said to be $2 per ton, and the extraction is claimed to exceed 90% of the assay value.

Maiden, November 10.

(Special Correspondence.)—The Kendall Gold Mining Co., operating at Kendall, has paid its seventy-first dividend of $10,000. This is the second dividend recently, a like amount having been distributed on September 22. The total of dividends paid to date is $1,305,000. The Kendall mine has run steadily since its mill went into operation 15 years ago. Finch & Campbell, of Spokane, own the controlling interest.

Kendall, November 12.

NEVADA

NYE COUNTY

(Special Correspondence.)—Since the automatic sampling machinery was installed at Eclipse mill six or seven lots of ore of about a carload each have been treated for local lessees. With one exception these lots ran from $20.40 to $35.80 per ton. The resumption of operations at this mill as a custom plant has stimulated work by local lessees.——The last ore at the Leland mill was run through on November 8. The ore came from the Hayseed mine at Lee, California. The last week's run at the mill was successful, although the exact amount of the clean-up is not yet known. The saving by amalgamation from this ore is from 75 to 80%. This mill is built on flat ground about three-fourths of a mile from Leland station on the T. & T. railway, and consists of three 1350-lb. Nissen stamps. Water for it is pumped from a nearby well 100 ft. deep. Part of the water from the battery is saved and returned to it by a water-wheel, which also elevates some of the tailing. Ore hauled in wagons is dropped through a grizzly to an underground bin from which it is hoisted in a skip to the mill bin by a Fairbanks distillate hoist, the engine of which furnishes the power for the mill.——The remodeled Wolftone mill at Manhattan resumed work a few days ago with full force.

Rhyolite, November 10.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence.)—At the El Paso fair the judges awarded the Mogollon exhibit first premium for display of gold and silver ores, and a diploma was given the Mogollon Gold & Copper Co. for gold-silver-copper ores.——Good progress is being made in sinking the main shaft at the Socorro mine. Development on the new orebody found in 500 East continues in good milling ore, of which 3600 tons was milled during the month. The use of air-drills was discontinued November 4, hand steel now being employed. Regular shipments of bullion and concentrate are being made.——At the Deadwood mines another vein 5 ft. wide carrying ore was cut in sinking sump below the 500-ft. level. This is on the foot-wall side of the Last Chance vein, which was passed through just below the 400-ft. level. In all, four well-defined veins have been cut in sinking the vertical shaft to the present depth. The oil engine, tables, and other machinery for the mill have reached Silver City; also the pipe for the water line. Rapid construction of the mill continues.——The last clean-up of the Ernestine M. Co. produced 11,495 troy ounces of bullion; 48 sacks of high-grade concentrate was obtained from 562 tons of ore crushed the past week. The recently installed pipe-line is furnishing ample water for the plant, by gravity, effecting a great saving over the old system of pumping. Thirty stamps are now dropping. On November 1 a night shift was put on in the mine and work is being pushed at a number of headings, all of which are reported in ore.——The Treasure Mining & Reduction Co. is taking milling ore from two of the old stopes.

Mogollon, November 11.

CANADA

BRITISH COLUMBIA

(Special Correspondence.)—The Standard mine, formerly known as the Grady group, between Silverton and New Denver, bought for $30,000 three years ago by John A. Finch, of Spokane, and George Ayland, of New Denver, has shipped ore worth $200,000, mostly during the period of development. The ore so far shipped has netted the owners $50 per ton, its content being from 65 to 70% lead and 80 to 100 oz. silver per ton.

New Denver, November 10.

(Special Correspondence.)—Shipments from the Granby mines showed a further increase for the past week, even though the ore from the 300-ft. level is being dropped into a pocket and hoisted through the Victoria shaft. A new tunnel is now being sunk, however, which will replace outlet No. 3, recently destroyed by fire. The new adit will probably be equipped with a crusher and a conveyor for loading cars at the Great Northern tracks. Machinery in the new shop was started up last week. This company has sent men to the Hidden Creek mine, on Observatory inlet, where development and diamond-drill work are to be started. Three diamond-drills and some rock-drills will be operated until spring.——Work has been resumed on the Greenwood-Phoenix adit with 15 men. Two 3¼-in. drills are being operated.——Development has been in progress on the Maple Leaf group at Franklin camp the past summer, and the work will be resumed next spring.——Work on the 15-ft. seam of coal now being carried on by the Osoyoos Coal Co., at Princeton, has exposed the seam for 310 ft. An entry has been driven on the seam for 100 ft. Three car-

loads of coal are ready for shipment which will be moved as soon as snow roads are in good condition.——Shipments of ore from the Boundary district for the week ended November 5 were: Granby mines, 18,546 tons; other mines, 12,479 tons; total for the year, 1,410,256 tons.

Phoenix, November 10.

(Special Correspondence.)—On the Perrier group south of Nelson an air-compressor is to be installed. The vein being opened is 2 ft. wide. A shipment of 10 tons to the smelter averaged $45 per ton. Alfred Crossley, of Nelson, is manager.——The vein on the King George V, on Bird creek, has widened to 3 ft. Assays of ore taken from the main vein have shown from $10 to $95 per ton in gold, mostly free milling.——The adit on the Dundee mine at Ymir has been driven nearly 400 ft. This adit must be driven 2300 ft. to cut the vein. This will give 1000 ft. of depth on the vein and will drain the workings.——At Moyie new orebodies have been opened at the St. Eugene mine of the Consolidated company. Work is being done on the Aurora and Society Girl mines there and regular shipments will be made this winter.——A carload of horses was taken to the Rambler-Cariboo mine last week, some of which are to be used in hauling ore from the mine to Three Forks during the winter.——At Sandon a body of ore has been opened on the Ruth. The Richmond-Eureka and Slocan Star are shipping and doing much development. The Noble Five, Panama, Idaho, Enterprise, and Hewitt are all making good showings, while the larger properties like the Van Roi, Standard, Lucky Jim, and Rambler-Cariboo are all making substantial additions to plant and preparing for a busy winter.——The ore and concentrate shipments from the Nelson-Slocan district for the week ended November 5 were 5360 tons, and for the year 257,277 tons.

Rossland, November 10.

W. Fleet Robinson, the provincial mineralogist for British Columbia, has just recently returned to the city of Victoria, from an official visit to Portland canal, where he examined a number of mineral claims in the new mining camp situated in the vicinity of the canal. Pending the issue of an official bulletin, his conclusions are, briefly, that there is as yet only one property in the camp tributary to Stewart, the town at the head of the canal, that may reasonably be regarded as a mine, namely, that of the Portland Canal Mining Co., of Victoria. This company has been developing two of its group of eight claims for three years, and recently completed the equipment of the first 75-ton unit of its concentrator. Ore is conveyed by aerial tramway from the mine to the concentrator and a concentration of about 3½ into 1 is being made. The plant was found to be doing excellent work, making an exceptionally clean separation. While the average value of the ore is low, it is considered satisfactory and should leave a fair margin of profit. There is a large quantity of ore blocked out and a still larger quantity practically assured. Much prospecting is being done throughout the district, but no other property than that above mentioned is yet in a position to ship ore on a commercial basis, nor likely to be until next year. Many claim-holders, however, are endeavoring to ascertain the worth of their respective properties. It may be added that the Portland Canal Mining Co. expects to ship at least 1000 tons of concentrate before the close of this year, probably early in December, and arrangements are being made for its transportation and reduction.——Reliable information concerning a new mining field at Steamboat mountain has been received in Vancouver from time to time during the last three months. Mineral claims have been staked there and in the surrounding country, and assays from specimens of ore from some of these are reported to have given returns ranging from $15 to $200 per ton. The new camp has not yet been visited by either Dominion or Provincial officials of the respective departments of mines, so no authoritative information as to its merits has yet been made. From men who have looked it over it has been learned that the formation is andesite, with intrusive sheets of quartz-porphyry, and that free gold can sometimes be seen in the latter. The field is distant about 40 miles from Hope, on Fraser river. It is in the vicinity of Skagit river, which flows south from the Hope mountains into the State of Washington. Hope is in Yale mining division, a small subdivision of the large Yale district, which embraces a considerable area of territory in central southern British Columbia. From Vancouver, B. C., to Hope, by the Canadian Pacific railway, the distance is 89 miles, the route thence to Steamboat mountain is by the Sumallow river trail and then down the Skagit. The new field is comparatively easy of access, but now that snow has fallen no effective surface prospecting will be practicable until next spring. Meanwhile several properties have been sold by the locators, and preparations are being made for developing them next season.

ONTARIO

(Special Correspondence.)—E. A. Wallberg, president of the Mines Power Co. (Ltd.), of Cobalt, says he will continue without loss of time the building of the Porcupine railroad. He expects to have cars running over 10 or 15 miles of line this winter. The remaining distance will be completed in the spring. The plan is to use steam this winter and as soon as the power plant can be completed next summer electricity will replace steam.

Porcupine, November 12.

(Special Correspondence.)—The six Herlehy-McPharland claims in lot 5, consessions 2 and 3, Tisdale, in Porcupine district, recently sold to E. V. Perkins, have been taken over by a syndicate of New York capitalists. A company is being incorporated to develop this property and a large force of men will be put to work at the mine. Assessment work on this property has opened seven veins, one of which is 8 ft. in width and pans gold freely. The Herlehy-McPharland group is in the heart of the richest section of the Porcupine area, about midway between the Rea and the Dome mines. The Rea Mines Co. is controlled by the Consolidated Gold Fields of South Africa, and the Dome Mines Co. by interests affiliated with the International Nickel Company.

MEXICO

CHIHUAHUA

(Special Correspondence.)—The October production of the Rio Plata Mining Co. amounted to 83,000 oz. silver, besides a large amount of concentrate.

Chihuahua, November 12.

VERA CRUZ

(Special Correspondence.)—The Huasteca Petroleum Co., which recently completed a pipe-line from Casiano to Tampico, is pushing the work of providing storage facilities for its product, both at Tampico and along the pipe-line. In addition to three large steel tanks, a 300,000 bbl. concrete reservoir will be built at Casiano. At San Geronomo, the first pump station north of Casiano, a concrete reservoir of 500,000 bbl. capacity will be built. In addition to the seven 55,000-bbl. tanks at the Tampico terminal, a million-barrel reservoir will be built. The pipe-line has a capacity of 26,400 bbl. per day. The pipe is 8-in. smooth bore and has been tested to 1200 lb. per square inch. The company has laid a cable across the Panuco river from Tampico. It is intended to extend the pipe-line across the river, thus connecting the terminus on the south side of the river with the railroad terminus on the north side. The bulk of the output of the company is taken by the Mexican Central railway, the Mexico National Gas Co., of Mexico City, and the Waters-Pierce Oil Co. A contract was recently entered into with the last named company for the supply of 2,500,000 bbl. of oil within the next five years, the price being 92½c. per barrel.

Tampico, November 10.

ZACATECAS

(Special Correspondence.)—Volney D. Williamson, of Spokane, has gone to New York to negotiate with the Exploration Company, Ltd., of London, for the sale of two mines in the State of Zacatecas, which were acquired years ago by the late V. M. Clement and Mr. Williamson.

Zacatecas, November 12.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

MINERS ASSUMPTION OF RISK

A driver in a coal mine does not assume the risk of injury due to the failure of a mine boss or mine operator to perform the statutory duty of making a dangerous place safe, where the statute clothes the mine boss with authority to exclude miners from any dangerous place in the mine until it is made safe; and such a driver in a coal mine does not assume the risk of injury, where the mine boss directs him to enter the place after it has been made safe, but by which he was in fact injured. The doctrine of assumed risk does not apply merely because the manner of making the place safe is left to the discretion of the mine owner and the judgment of the mine boss.

Princeton Coal Mining Co. *v.* Howell. (Ind.) 92 Northeastern 122. June, 1910.

STATUTE REGULATING SPRINKLING AND VENTILATING MINES

The statute of Indiana (Burns' Ann. St. 1908, section 8579) provides that roadways or entries in any mine shall be regularly and thoroughly sprinkled when they are so dry that the air becomes charged with dust; and it is made the duty of the mine inspector to see that the provision is complied with. The fact that this provision is a part of the same section in which provision is made for ventilating mine in no wise abrogates the duty to sprinkle, irrespective of the subject of ventilation, and was imposed for the benefit and protection of persons employed in the mine. A failure of the mine operator to so sprinkle the roadway and entries when so filled with dust, and from which a dust explosion resulted, injuring a miner, as required by the statutes was negligence on the part of the owner or operator and entitled the injured miner to recovery. The failure to sprinkle may be charged as the proximate and direct cause of the explosion and the injury of the miner. The dust in such case would be regarded as the efficient or proximate cause of the explosion and injury.

Vandalia Coal Co. *v.* Yemm. (Ind.) 92 Northeastern 49. June, 1910.

INJURY TO MINER—MEASURE OF DAMAGES.

In an action for damages to a miner, worldly condition of the parties, such as poverty or riches, whether possessed of property, whether industrious, whether married or single, or having a family, or a large or small family, the number and ages of the family, standing of the parties in the community, and whether anyone is dependent on such injured miner for support, cannot be proved, as this and similar conditions are too likely to arouse the sympathy of jurors to a degree beyond award of compensation; but evidence as to the occupation and compensation, and that the injured party is not able to follow his usual occupation, does not fall within this rule. The elements of mental anguish cannot be specialized or calculated and hence must be left to the sound discretion of the jury; but the damages awarded must be those arising from pecuniary loss, in which physical condition and earning capacity at the time of the injury, and the effect of the injury upon such capacity, are necessarily involved, together with physical pain and mental anguish arising from the injury inflicted and expenses incurred in treatment, nursing, etc.; mental anguish arising from apprehension cannot be considered. Where it was shown that the miner was badly burned about his hand, head, and body; that he was injured internally by inhaling the gases, smoke, and dust; that he was permanently injured; that he suffered and continued to suffer great bodily pain and mental anguish; that he was unable to work for a period of many months, during which time he could have earned $5 or $6 per day and where he had expended $200 for medicine and for medical aid and nursing, a judgment for $10,000 was not excessive.

Vandalia Coal Co. *v.* Yemm. (Ind.) 92 Northeastern 49. June, 1910.

Recent Publications

ANNUAL REPORT OF THE STATE GEOLOGIST OF NEW JERSEY, FOR 1909. By H. B. Kümmel. Pp. 123. Index. Trenton, 1910. Treats largely of the State water supply.

PRODUCTION OF MONAZITE AND ZIRCON IN 1909. By Douglas B. Sterrett. U. S. Geol. Surv.; advance chapter Mineral Resources, 1909. Pp. 11. Washington, 1910.

ANALYSES OF ORES, NON-METALLIC MINERALS AND FUELS. Report of Chemical Laboratories, Department of Mines, Canada. By F. G. Wait. Pp. 126. Ottawa, Canada, 1910.

WOOD-USING INDUSTRIES OF NORTH CAROLINA. By Roger E. Simmons. North Carolina Geol. Surv. Pp. 74. Ill. Raleigh, 1910. Deals with timber supply of the State, its uses and conservation.

GYPSUM DEPOSITS OF NEW YORK. By D. H. Newland. Education Department, Bulletin No. 43, New York State Museum Pp. 94, Ill., maps, index. Albany, 1910. Describes history, occurrences, geology, and uses of gypsum.

THE FRIAR-LAND INQUIRY, PHILIPPINE GOVERNMENT. By W. C. Forbes, D. C. Worcester, and F. W. Carpenter. Pp. 208. Manila, 1910. Relates to the official inquiry into the administration and sale of friar lands by the Philippine Government.

MINERAL RESOURCES OF THE PHILIPPINE ISLANDS. By Warren D. Smith, issued by the Division of Geology and Mines, Bureau of Science. Pp. 81. Ill. Manila, 1910. Describes mineral districts and some individual mines, and running methods.

MONOGRAFIAS MINERAS I METALURJICAS. By F. A. Sundt. Pp. 217. Ill. This volume in Spanish gives a comprehensive account of the present condition of the mineral industry in Chile. Issued under the auspices of the National Mineral Society, Santiago, Chile.

VOLATILE MATTER IN COAL. By H. C. Porter and F. K. Ovitz. Bull. 1, U. S. Bureau of Mines. Pp. 55, Ill. Washington, 1910. This, the initial bulletin of the new Bureau, includes a scholarly account of experimental work on a matter of large practical importance.

NINETEENTH ANNUAL REPORT, BUREAU OF MINES, ONTARIO. By F. Cochran, Minister of Mines. Pp. 245. Index. Ill. with maps. Ottawa, 1910. Contains the usual report of the condition of the mining industry in the Province of Ontario, with description of new camp of Porcupine.

GRANITES OF THE SOUTHEASTERN ATLANTIC STATES. By T. L. Watson. U. S. Geol. Surv. Bull. 426. Pp. 282. Index, map, and ill. Washington, 1910. This work treats exhaustively of the occurrence of granite and similar rocks suitable for structural purposes. Many quarries are described together with the character of the rock obtained.

RECENT ADVANCES IN CONSTRUCTION OF ELECTRIC FURNACES. Bull. 3. Department of Mines, Canada. By Eugene Haanel. Pp. 76. Ill. Ottawa, Canada, 1910. Describes the various types of electric furnace used in the smelting of iron ore and the manufacture of steel; also in the reduction of spelter and zinc oxide. It contains a number of detailed drawings.

GOLD DREDGING IN CALIFORNIA. By W. B. Winston and Charles Janin. Bull. 57, California State Mining Bureau. Pp. 32, Ill., maps, index. San Francisco, 1910. This is an excellent report covering the statistics and technology of the dredging industry. It is lacking in that the discussion of the geology of the dredging fields is disappointingly brief and is quite inadequate to the purposes of an engineer who desires to learn where to look for other dredging fields. However, where there is so much that is good, it would be but cavilling to emphasize the defects. As to the conditions under which the engineers worked who prepared the bulletin, see editorial comment.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

H. F. Bain is at Bakersfield.

E. B. Kirby is in San Francisco.

Ralph Arnold is in San Francisco.

J. R. Finlay was in San Francisco.

John B. Farish is in San Francisco.

Albert Burch has returned from Alaska.

C. H. Munro has returned from the North.

Bertram Hunt has gone to Mercur, Utah.

Arthur L. Pearse has returned to London.

George Otis Smith is visiting California oilfields.

E. A. Sperry is at Nicolaus, California, making surveys.

Walter W. Johnson has returned to San Francisco from Nome.

J. A. Crose, of Boise, Idaho, recently visited Parrall, Mexico.

Dan Patten, of Calistoga, California, has been in San Francisco.

Alexander Inglis has returned from Mexico and will reside in Los Angeles.

James A. Barr is in the Nashville hospital recovering from a slight operation.

J. Nelson Nevius has returned to Los Angeles from Oroville and Plumas county.

Roy H. Clarke recently returned to Spokane from the Altar district, Sonora, Mexico.

H. S. Walker has left the service of the Real del Monte company and is in Mexico City.

E. M. Ray, of Pittsburg, is inspecting various mines in the State of Chihuahua, Mexico.

S. E. Bretherton, who is in Sonora, Mexico, expects to return to San Francisco December 1.

Arnold S. Langley has left the service of the Britannia M. & S. Co. and is at Crofton, Vancouver Island, British Columbia.

H. P. Eells, president, with W. W. Coleman and E. K. Swigart, vice-presidents of The Bucyrus Co., are in San Francisco.

W. F. Harrison has resigned as manager for the Indé Gold M. Co., at Indé, Durango, Mexico. He is succeeded by R. McCart.

Edmund T. Perkins has resigned from the U. S. Reclamation Service and has opened an office at 1110 First National Bank building, Chicago.

G. A. Guess has resigned as smelter superintendent for the Tennessee Copper Co., and sails from New York about December 1 for Cerro de Pasco as metallurgical superintendent of that plant.

John V. N. Dorr, accompanied by his family, sails for England on the *Blucher*, from New York, on November 19. He will be abroad about a month. Mr. Dorr will make his London headquarters at the offices of *The Mining Magazine*, Salisbury House.

The San Francisco Section of the Mining and Metallurgical Society will give a subscription dinner in honor of George Otis Smith, director of the U. S. Geological Survey, at the Palace Hotel, November 22, at 6:30 p. m.

The Bureau of Mines has just sent one of its rescue cars to Chicago. From there the car will go to a number of Illinois mining towns before proceeding to Rock Springs, Wyoming. Sumner S. Smith is in charge, and will be assisted by a representative of the Red Cross. They will give demonstrations in the use of rescue apparatus and will take the preliminary steps looking toward the organization of rescue companies in all the mining towns of Illinois.

Market Reports

LOCAL METAL PRICES

San Francisco, November 17.

Antimony	12 – 12½	Quicksilver, flask	46 – 48
Electrolytic Copper	14⅝ – 14¾	Tin	39½ – 40
Pig Lead	4.50 – 5.00	Spelter	7 – 7½
Zinc dust, 1400 lb. casks, per 100 lb., small lots	8.50 – 9.75;	large	8.00 – 8.50

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date.	Electrolytic Copper	Lead.	Spelter	Silver, per oz.
Nov. 10	12.75	4.40	5.90	55⅛
" 11	12.75	4.40	5.90	55¼
" 12	12.75	4.40	5.90	56
" 13	Sunday.		No market.	
" 14	12.78	4.40	6.03	55⅞
" 15	12.78	4.40	6.03	56
" 16	12.78	4.40	6.04	55⅞

ANGLO AMERICAN SHARES

Cabled from London

	Nov. 9 £ s. d	Nov. 16 £ s. d
Camp Bird	1 10 3	1 10 9
El Oro	1 6 6	1 5 9
Esperanza	2 5 0	1 17 6
Dolores	1 5 0	1 5 0
Oroville Dredging	0 7 0	0 7 0
Mexico Mines	7 13 0	7 15 0
Tomboy	0 18 1⅞	0 18 1⅞

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Nov. 17.		Closing prices, Nov. 17.
Adventure	$ 8¼	Mohawk	$ 49¼
Allouez	42	North Butte	35½
Atlantic	7	Old Dominion	42
Calumet & Arizona	54¼	Osceola	130
Calumet & Hecla	580	Parrot	13
Centennial	17⅛	Santa Fe	1⅛
Copper Range	70½	Shannon	13
Daly West	3⅝	Superior & Pittsburg	14¼
Franklin	11¼	Tamarack	57
Granby	43½	Trinity	5⅛
Greene Cananea, ctf.	7¼	Utah Con.	24
Isle-Royale	20⅝	Victoria	2½
La Salle	7¼	Winona	9½
Mass Copper	8½	Wolverine	127

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Nov. 16.		Closing prices, Nov. 16.
Amalgamated Copper	$ 81¼	Miami Copper	$ 20
A. S. & R. Co.	67¾	Mines Co. of America	5¼
Braden Copper	4⅝	Montgomery-Shoshone	1/16
B. C. Copper Co.	6½	Nevada Con.	20⅝
Butte Coalition	20¾	Nevada Utah	1
Chino	21⅞	Nipissing	10⅞
Davis Daly	1¾	Ohio Copper	1¼
Dolores	5½	Ray Central	2⅜
El Rayo	3⅞	Ray Con.	19⅞
Ely Central	12¾	South Utah	1½
First National	1⅞	Superior & Pittsburg	14⅝
Giroux	7½	Tenn. Copper	36½
Guanajuato Con.	⅝	Trinity	57⅛
Inspiration	9⅝	Tuolumne Copper	4⅜
Kerr Lake	7⅛	United Copper	5¼
La Rose	4	Utah Copper	50¼
Mason Valley	10½	Yukon Gold	3¼

SOUTHERN NEVADA STOCKS.

San Francisco, November 17.

Atlanta	$ .14	Mayflower	$ .05
Belmont	4.50	Midway	.18
Booth	.08	Montana Tonopah	1.00
Columbia Mtn.	.03	Nevada Hills	2.30
Combination Fraction	.25	Pittsburg Silver Peak	.65
Fairview Eagle	.15	Rawhide Coalition	.05
Florence	1.85	Rawhide Queen	—
Goldfield Con.	8.05	Round Mountain	.47
Gold Kewenas	.08	Silver Pick	.07
Great Bend	.03	St. Ives	.14
Jim Butler	.29	Tonopah Extension	1.05
Jumbo Extension	.24	Tonopah of Nevada	8.25
MacNamara	.26	West End	.53

(By courtesy of San Francisco Stock Exchange.)

JEFFREY EXHIBIT AT THE WESTERN PENNSYLVANIA EXPOSITION

Thousands of visitors, including a large number of coal operators and mine superintendents, were afforded a novel treat in their visit to the Jeffrey exhibit of modern mining machinery, considered by every one who saw it, the feature at the Western Pennsylvania Mining Exposition. This exhibit, occupying a space 100 ft. in length by 30 ft. wide,

was situated in the northwestern corner of the Machinery hall. It was designed and built by the Jeffrey Manufacturing Co., Columbus, Ohio, being in the form of a model mine room, showing their latest and most improved types of mining machines, electric drills, as well as electric mine locomotives, in actual operation, practically as they would be operated in underground workings. This mine room had a coal face 45 ft. long by 6 ft. high, constructed of large lumps of bituminous coal. Practical demonstrations were daily conducted by the operators actually undercutting and drilling the coal and hauling same out of the room.

OCTOBER COPPER REVIEW

The Copper Producers' Association statement, issued November 10, shows a large decrease in stocks at the end of October as compared with September. The figures, in pounds, follow:

	Oct. 1910.	Sept. 1910.	Oct. 1909.
Stocks	148,793,714	168,881,245	151,472,772
Production	126,069,284	119,519,983	124,657,709
Totals	275,262,998	288,401,228	276,180,481
Domes. delivery	67,814,172	64,501,018	66,359,617
Exports	68,186,910	75,106,496	56,261,238
Total consumption	136,001,084	139,607,514	122,620,855
Stocks remaining	139,261,914	148,793,714	153,509,626

L. Vogelstein & Co. report the following figures of German consumption of foreign copper for the months January to September 1910:

	Tons.
Imports	129,440
Exports	6,938
Consumption	122,502

Of the above quantity, 111,131 tons were imported from the United States. Consumption during the same period in 1909 was 114,960 tons.

COMMERCIAL PARAGRAPHS

The Hendryx Cyanide Machinery Co. has installed at its testing plant at 107 William street, New York, a Merrill zinc dust press.

The Harbison-Walker Refractories Co., Pittsburg, Pa., announces that Kenneth Seaver has been appointed chief engineer of the company.

The Wood Drill Works, Paterson, New Jersey, has issued a special circular giving brief facts concerning the dimensions of the Panama Canal, and incidently a view of Wood rock drills at work on the Miraflores lock chamber.

Warren B. Lippincott and James M. McClave have formed a partnership under the name of Lippincott & McClave, with offices at 601 and 602 Ideal building, Denver, Colorado, where they will engage in practice as chemical and metallurgical engineers.

The Lane Slow Speed Chilian Mill Co., Los Angeles, reports sales of Lane mills to the following: Victory Gold Mining Co., Ophir, Montana; Llano Gold Mining Co., Llano, Texas; R. M. Wilson, Grants Pass, Oregon; Cia. Minera Zaragoza, Zacatecas, Mexico; Rodolfo Munoz, Guadalupe, Mexico; Unity Mining Co., Virginia City, Nevada.

CATALOGUES RECEIVED

Hendryx Cyanide Machinery Co., New York. Catalogue No. 7. Illustrated, 24 pages, 5½ by 8 inches.

The Cyclone Drill Co., Orrville, Ohio. General Catalogue A-50. 'Prospecting Machinery for Coal, Water, Oil, Gas, Mineral, and Placer Mining.' Illustrated. 128 pages. 7 by 10 inches.

The Stearns-Roger Mfg. Co., Denver. Catalogue 100, Section 127. 'The Edwards Mechanical Roasting and Chloridizing Furnaces, and the Edwards Ore Cooler.' Illustrated. 28 pages. 7¼ by 9 inches.

Falkenburg & Laucks, Seattle, Wash., booklet showing views of the laboratories and information concerning the assaying, testing, and inspection service rendered by this concern. Illustrated, 16 pages, 3½ by 6 inches.

The annual report of the Consolidated Mining & Smelting Co. of Canada for the year ended June 30, 1910, has just been issued. This company operates large mines at Rossland, Phoenix, and several other camps in British Columbia, with a smelter at Trail. The amount of ore treated at the smelter was 487,125 tons, returning a profit of $309,945.08. The ore treated yielded 137,614 oz. gold, 2,162,406 oz. silver, 42,368,816 lb. lead, and 5,974,959 lb. copper. Total value, $5,911,767. During the year two new properties were purchased—the Molly Gibson group, near Nelson, and Group No. 7 in Boundary district. Property and plant account shows an increase of $244,202.19.

The United States Civil Service Commission announces an examination on December 7, 1910, at all regular examination centres in the United States, to secure eligibles from which to make certification to fill vacancies as they may occur in the positions of mineral examiner in the Forest Service at $1800 per annum, and also in positions of surveyor for the inspection of mineral deposits under the Chief of the Field Divisions of the General Land Office, at $7 per diem. Candidates should at once ask for application and examination form 1800.

On Friday, November 4, 1910, the Bunker Hill & Sullivan M. & C. Co. paid dividend No. 158 of $81,750.

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CUDAHY, WIS., U.S.A.

District Offices: New York, Chicago, Atlanta, El Paso, San Francisco

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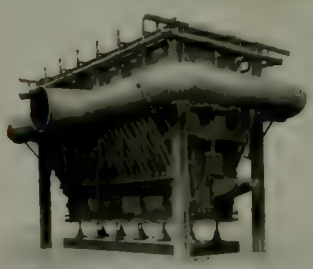

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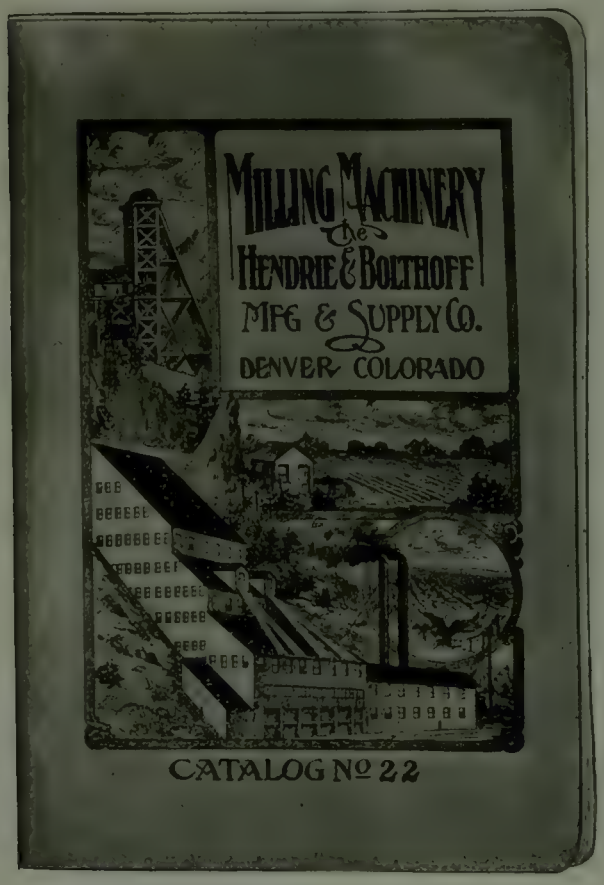

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EDITORIAL

UNREST continues in Mexico, as is evident from daily press despatches. There is little doubt, however, that the Government will deal firmly with the situation, promptly suppressing every revolutionary demonstration.

DIVIDENDS have been suspended by the Round Mountain Mining Company pending appeal to the Supreme Court of Nevada from the adverse decision in the District Court of Nye county, whereby the company has been held liable for $165,000. This mine, which has been remarkable for the richness of its ore and the ease with which it was milled, thus proves anew that in estimating cost of mining rich ore in America an engineer should never neglect to allow generously for litigation.

FIRE injured the top works at the Pittsburg mine last week, but did not destroy the plant. Mr. M. B. Kerr was fortunate in having an ample supply of water under pressure and with it was able to save most of the machinery and buildings. The Pittsburg is one of the old mines of Nevada county now being re-opened. The shaft had been pumped dry and sufficient development done to give assurance of good orebodies, so the plant will be rebuilt at once.

DISCOVERY of oil in the Bohemian well, south of Coalinga, California, is of unusual interest since, if the amount be important, the discovery will add several miles to the proved territory. The officers of the U. S. Geological Survey had estimated that the oil sand would be found at 3600 feet in depth, an estimate which proved almost exact. The oil is brown in color and is said to test 40° B. Until more work is done it will be impossible to say what the production will be, but it is thought that a good well has been found.

PORCUPINE is Canada's latest contribution to the mining camps of the world. On another page of this issue will be found an interesting description, by Mr. Reginald E. Hore, of the geology of the district, and of several of the more important vein outcrops. Judging from the description by Mr. Hore, the veins of Porcupine greatly resemble some of the Mother Lode of California, particularly those in Mariposa, Tuolumne, southern Calaveras county, in central Amador county near Jackson, and also at and near Placerville, El Dorado county. In these several localities there are huge masses of the carbonate of lime, magnesia, and iron, commonly known as ankerite, which are seamed with large and small veins of quartz, in much the same manner

as that described as occurring at Porcupine. In California these great masses of ankerite, some of which are over 300 feet wide, are usually accompanied by an abundance of the green micaceous mineral, mariposite. No mention of mariposite, or any mineral answering its description, is made by Mr. Hore. However, mariposite is sometimes absent in the California ankerite masses. Generally, the ankerite of the Mother Lode is auriferous, though not to a profitable extent. That in the Rawhide mine in Tuolumne county was an exception, some of it being extremely rich in gold.

SWANSEA and Vivian are names well known in metallurgy. It is interesting to note that according to the terms of the will of Mr. R. G. Vivian, who died last June, £40,000 is to be set aside to found and endow Glynn Vivian Miners' Missions, one each in the United Kingdom, France, Spain, Germany, Siberia, Russia, South Africa, and Chile. The list suggests the width of interest of the firm of Vivian & Sons. It is proposed to build halls "to be made comfortable and as attractive as possible with books, newspapers, and a supply of tea and coffee, so as to draw miners and other persons whom the halls are intended to benefit, away from the drinking bars." Many such attempts have been made, not always with great success. Such clubs, however, are to be encouraged even if they are not always appreciated. The purpose of the gift may be commended, as well as the spirit that led Mr. Vivian to try to make some return to the great industry from which he drew his wealth.

SUCCESS is attending the application of the Cottrell process to clearing the smelter smoke at the Coram plant of the Balaklala Consolidated Copper Company. This is the more notable since owing to the exigencies of the situation it was necessary to build the working plant with one hundred times the capacity of the experimental apparatus. This was a bold leap into the unknown, and it is not surprising that at first the big plant was not entirely successful. Many baffling difficulties were met, but now the apparatus is working steadily, clearing the smoke of 90 per cent of the solid matter. If the gases were discharged from several stacks instead of one, the smoke would not be dense enough to be noticed. It is evident that the remaining difficulties can be overcome, and a great step in metallurgical progress is to be shortly completed. We offer hearty congratulations to Mr. F. G. Cottrell, the inventor, and Mr. R. T. White, who as manager had the courage to install the apparatus on a working scale where failure would have been most disastrous.

PRESS DESPATCHES state that a six-inch bore-hole in the bottom of the El Paso shaft, on Beacon hill in the Cripple Creek district, Colorado, has reached the Roosevelt drainage adit. This bore-hole is draining the famous El Paso workings, the water being under control. The adit has advanced to a point very near the El Paso shaft and near the contact of the granite and the andesite, but whether the adit will be driven beyond the El Paso mine has not yet been determined. It is thought that a very wide area will be benefited by the drainage adit for the reason that the effect of pumping operations in the El Paso mine was noticeable in some of the deep mines near Goldfield. When pumping at the El Paso was suspended the water rose in the mine-workings two miles away, and when pumping was resumed the water level in these mines soon gave evidence of it, indicating that there was a direct connection between the district about the El Paso and the mines near Goldfield and Victor. Should the drainage adit prove to have a marked effect on the water level of these distant mines, in all probability the drainage project will not be advanced for some time, but if it does not have a beneficial effect, then the adit will doubtless be driven forward to drain the Portland, Vindicator, Golden Cycle, and other mines of that vicinity.

Oil on Public Land

In the California oilfields the situation as regards title to wells drilled on public land is thoroughly bad. Remedial legislation is needed at once, and in obtaining it the oilmen deserve and should have, the assistance of all right-thinking men. Through executive withdrawals, new legislation, and Land Office decisions, the operators have been placed in a most unexpected and embarrassing situation. The great Lake View well is on land that, according to present interpretation, cannot be patented, though it was located prior to withdrawal, and there can be no question either as to the discovery of oil or the good faith of the owners. Of the 169 companies operating in the Coalinga field it is estimated that 75, claiming 11,000 acres or more, are unable to proceed to patent, though they have collectively expended nearly two and a half million dollars in drilling and have brought in a large number of excellent wells. While these companies cannot obtain patent, neither can they stop drilling without losing what few rights remain to them. In many cases it is impossible to turn into cash the oil already produced, and with all these uncertainties it is naturally impossible to interest capital so as to continue the drilling required by the terms of the withdrawal law. To make a bad matter worse, it is rumored that the Post Office department is likely to proceed against all those companies that have been using the mails to sell stock, where the operations are being conducted on unpatented land. As a net result, production is being unnecessarily forced at the same time that men who have already invested are straining every resource to meet unexpected assessments.

In order to understand the situation it is necessary to recall that prior to the withdrawal of the oil lands many claims had been located by men who proceeded according to established custom and followed current court and Land Office interpretations. In entire good faith they obeyed the law as it was then known. There was no question of dummy entrymen, of agricultural or gypsum claims, or of any

other irregularity. When Congress passed the act validating the executive withdrawals a clause was incorporated in the law to protect the equities of those who had previously entered lands and who had continued in good faith to develop the property. Shortly thereafter patents were refused on the ground that discovery had not been made prior to location and that transfer of title had occurred before issue of patent. These rulings, while well founded in law, were new and completely changed the conditions. Practically the oilmen have now no assurance of title except belief in American fair play and justice. Under most trying conditions they are showing their own good faith not only by continuing to diligently proceed with development, but by making a full and frank statement of their case. The region has recently been visited by Mr. Frank Pierce, Assistant Secretary of the Interior, and Mr. George Otis Smith, Director of the United States Geological Survey. They have been given every facility for learning the facts and seeing the exact situation. In addition, the oilmen have selected a strong committee to present their case at Washington. There will be many differences of opinion as to what legislation should be enacted to govern future development of oil on the public land, but there should be no differences as to the justice of giving prompt relief to those who in good faith have already risked their time and money following the law as it was interpreted at the time they began work.

Proposed Mining Method

In past years mining has seen many changes. The methods of today are in some respects entirely unlike those in common use during the greater part of the nineteenth century. The square-set system of sustaining the backs of stopes was introduced in 1860 on the Comstock Lode, in Nevada, and for over forty years was practically the only one employed in large stoping operations throughout the world. In some districts other and better methods have been evolved, though the square-set is still employed where no better way has been found to meet the existing conditions, and it is likely to be used in such places for years to come. Stoping with little or no timber, top-slicing, and various other methods have replaced the very useful Nevada square-set. Elsewhere herein will be found a rather startling proposal, by Mr. G. E. Wolcott, to dispense with blasting in underground mining, substituting channeling and the wedging out of blocks of solid rock, for the usual method of breaking the rock with dynamite, or other blasting agent. The proposal is startling, even revolutionary, and there seem to be many obstacles to its successful adoption, at least from an economic standpoint. Doubtless a machine could be designed to accomplish all that Mr. Wolcott proposes in the cutting of channels, but the breaking out of the solid blocks of rock between the channels is a matter that seems to interpose some difficulties, particularly as to the element of time required to [illegible] what are known as [illegible] drive the pieces with a [illegible] How rapidly this could be accomplished on rock sections 20 inches or more in thickness with only 4 feet or thereabout between the ends of the channels is wholly a question of trial. Moreover, some rocks would doubtless yield much more readily than others, a hard brittle rock, for instance, breaking possibly with comparatively little trouble, while a tough hornblende rock might resist to such an extent as to render all efforts futile. Mr. Wolcott says that the size of the blocks to be broken may readily be controlled, suggesting that if the channels be first cut only a foot deep, smaller blocks may be broken out than where the channels are cut deeper. This is true, if they could be broken at all, but to break a block of solid rock 20 inches thick with channels only 12 inches deep looks, upon the face of it, as though it would prove to be a difficult operation. Undoubtedly it would be easier to break the rock if the channels were cut 3 feet deep, as well as 4 feet or more wide. As a result, the blocks would be larger than are generally desired in mining operations and these would have to be broken before handling, which would cause the expense of mining to increase materially. The method of mining coal by what is known as 'undercutting' is, to a limited extent, not unlike the proposition suggested by Mr. Wolcott. All mining men, from shoveler to manager, are familiar with the effect of the gas due to the explosion of nitro-powder underground, and if any mining method can be introduced which will in some measure reduce this evil, the inventor will confer a great boon upon those who work in metal mines, and particularly in those that are poorly ventilated. It may be that by cutting a channel four feet deep across the face of a drift at the bottom and then putting in a round of ordinary drill-holes, the ground may be more easily broken, with fewer holes and much less powder than by the method usually employed in breaking a four-foot round. As to the cost of channeling, the figures submitted by Mr. Wolcott are extremely doubtful. He quotes a cost of 20 cents per square foot of area channeled. This may be a sufficiently liberal estimate, but is probably not, when the conditions under which the channeling must be done are contemplated. Channeling in a quarry in the open air is quite a different matter from working in the face of a drift underground, aside from difficulties due to the condition of the air and the necessity for timbering.

On the whole, the proposition of Mr. Wolcott is merely suggestive, and may stimulate experimentalists, those of investigative minds, to give the channeling machine a trial with a view to ascertaining what results may be possible. Should there be any such, we sincerely hope they will not withhold the result of their experiment but give it to the mining fraternity through the medium of our columns. To us, the plan seems mechanically possible, but economically, far from desirable.

Thunder Mountain Landslide

By Karl Baumgarten

Somewhat more than a year ago there occurred a mud flow nearly three miles in length, damming back a stream to form a lake which flooded the town of Roosevelt in the Thunder Mountain mining district of central Idaho. The town lay at an elevation of 6000 ft. in a narrow valley between steep rock slides on Monumental creek, at a point immediately above the junction of Thunder Mountain creek with Monumental creek. In ascending the former, the steep rock slides are especially prominent at a point about a mile north of the Dewey mine, just before entering the zone of the decomposed lavas pertaining to the Thunder Mountain mining district proper. From the Dewey mine to the base of Thunder mountain there is an area or basin at an average elevation of 7500 ft., less steep than the topography south of Thunder mountain, which lies three miles south of

Town of Roosevelt, Looking Down Stream Toward the Mud Dam

the town of Roosevelt, or at Roosevelt itself. Thunder mountain rises to an elevation of about 8500 ft.; the name was applied to this mountain by pioneers who were disturbed by its rumblings in clear as well as in stormy weather, by day as well as by night. Geologically, the mass of Thunder mountain contains a succession of lava flows and intrusions of several types and ages, in various stages of alteration, but in the main highly decomposed. Though no previous mud flow has been recorded, the recent flow indicates what has probably gone on for ages past, and there is evidence on the south side of Thunder mountain that just such flows have taken place there on a smaller scale than this one which is recorded on the north side.

The history of the flow here described is as follows. Early one evening in May 1909 a man started from Roosevelt to return to the mines near the base of Thunder mountain; but after a short absence he returned, saying that he had encountered a 'river of mud' at a short distance above town, and that it was moving rapidly down. Several of the inhabitants sauntered down to the lower end of town where Thunder Mountain creek comes in. They looked and hurriedly returned to prepare to leave their homes. The mud flow with its débris of rock and timber reached Monumental creek during the evening and 'fanned out' both up and down stream, effectually damming the creek. Monumental creek was swollen by the melting snows at its headwaters and at 2 a. m. the town began to be flooded. At 8 a. m. the water had reached the second stories of the cabins, and within the day those same cabins were afloat upon a lake 30 ft. deep, 1500 long, and 300 across.

That area or basin which commences northwest of the Dewey mine and extends southward to the foot of Thunder mountain, is roughly a half mile wide and a mile long. The basin is covered in winter by great depths of snow which, upon melting, in the spring,

Landslide at Thunder Mountain.

saturates the underlying mass of decomposed rock. The latter is granular and only slightly cohesive, so that when thoroughly wet it lets go. Slipping and movement takes place each spring in greater or less degree up to the very foot of the mountain. The comparatively solid masses which form the Dewey mine, though now lying at a distance of a half mile from Thunder mountain, undoubtedly once formed a part of the mountain; that the mass was moving even before the time of the mud flow is evinced by the complaint of the mill workers that they could not keep the machinery in alignment. Where no other physical sign is outwardly visible the inclined

position of the trees upset by the changes in level or even by the drag of the moving mass indicates that movement has taken place. Step-faulting is concentric with diagonality across or even parallel to the speeder terse or 'draw' from which the bulk of the material for the mud flow came. The throws of these faults are found to be from the scarcely perceptible up to 30 ft. or more. Formerly a road wound through the basin, and this road has been rendered impassable to wagons by the sharp steps

The Mud Flow at the Slides.

of the faults. Along the edges of the main movement boulders are cast up in furrows parallel to the direction of the movement, exhibiting all the appearances of the lateral moraines of a glacier. Close to the foot of these a bridge has been moved to a point 100 ft. north of the original road. According to the accounts, the walls of the 'draw,' a quarter

Junction of the Creeks Where Monumental Creek Cut a New Channel.

mile in length, stood nearly vertical for a height of 90 ft. and 250 apart.

Of the more solid particles carried down by the mud flow, the boulders are becoming disintegrated where exposed at the surface as a result of air-slacking or frost action. In spite of the solid materials, the yielding character of the thoroughly wetted mass of the mud flow prevented any apparent scouring action along its path. The melting snows of the past spring have cut new channels through the mud flow, and at one point disclose a thickness of about 30 ft. The rate of flow was estimated to have been 6 ft. per minute. If this is true it is surprising that the people of Roosevelt were not sooner warned.

The Mining and Smelting Industry of Colorado

BY FRANKLIN GUTHRIE*

"In its recent call for the Annual Convention of the Mining Congress, the invitation said in part: 'Within the last three years, it is safe to say, the total annual output of mineral, coal, and oil wealth in the United States has decreased not less than 25%, and perhaps 33%.' " Presumably this startling declaration was founded on statistics furnished by the United States Government, and may in consequence be accepted as true. In Colorado the falling off in mineral production has been confined practically to gold, silver, and lead, especially silver and lead, and the decrease has been so startling as to lead this Chamber to appoint a committee whose chief function is to make a thorough inquiry into the causes for the decadence of our mining and smelting industries, and to suggest means for their revival. I am advised that it is the custom of this Chamber to call for reports of progress from its several committees from time to time, and, as chairman of the committee on mines and mining, I have been requested to say something to you about the present status of the mining and smelting industries in Colorado, and to indicate in some measure the results which have followed our investigations to date. If your committee is not able at the present time to furnish the Chamber a specific report on the important matters which have engaged its attention, it may be said in extenuation that your board of directors was advised initially that the work which has been undertaken is one of magnitude and that the gathering of the necessary data would involve much time, detailed labor, and analysis. It is not unlikely even that failure to secure the desired and necessary information may result. At the present time it is too early to state what the outcome of our investigations will be. It may, however, be permissible to dwell briefly on some of the more important causes which have contributed to the decadence of mining in Colorado with the coincident enforced curtailment of the smelting industry, which is dependent thereon. It is most unfortunate for our State that the impairment of the mining and smelting industries has from time to time been made a political issue, and that in discussing these vital industries, some have not hesitated to misrepresent the facts, and thus mislead not only our own citizens, but also those from other States. It is unfortunate that the subject of ore-treatment charges and of ore schedules is complex; that the metallurgical processes are intricate and technical, and that the metal recoveries attendant on these processes are sometimes astoundingly variable and often uncertain in their outcome. Coincident with these technical considerations comes the application by smelting and milling companies of tariffs, or ore schedules, as they are termed, and

*Abstract of an address read before the Denver Chamber of Commerce.

as these schedules vary greatly with the character as well as the value of ore, it appears, superficially considered, that the rates of payment for metals in ores are not only complex and sometimes incongruous, but that they are framed with the specific underlying idea to confuse, if not to deceive, the ore seller. To him, however, who is familiar with the marketing of ores, a familiarity which comes with mining and commercial experience, there is nothing obscure or involved in the schedules; and for him it is a simple matter to resolve at once the terms of payment for his ore into a net value per ton. The more complex the ore, considered in its mineralogical character, the more complex apparently is the ore schedule on which the mill or smelter buys it. To illustrate:

The simplest tariffs are those applying to ores which are treated in a stamp-mill, where the ore is stamped, passed over amalgamated plates where the gold is extracted to as large an extent as possible, and the tailing treated on concentrating tables. In this case the millman charges the ore producer a fixed sum per ton for milling the ore, and turns over to him the gold amalgam and the concentrate. The amalgam is retorted and the gold sold to the Mint, while the concentrate is sold to the smelter on a simple schedule, because the product is simple in its mineralogical nature. The second case is that covering such ores as the Cripple Creek gold ores, in which a fixed sum per ounce is paid for the gold content and an increasing treatment charge per ton is applied as the ores increase in value. The last case is that involving the purchase of ores, complex in their mineralogical character, which may contain gold, silver, copper, lead, zinc, bismuth, antimony, and arsenic. Such ores in smelting involve the production of by-products which demand repeated metallurgical treatment. In these processes the recoveries of the metals, gold, silver, lead, and copper, are dependent on technical skill. The payment for recoverable metal content in such ores is governed by the ability of the smelter to effect certain savings which experience has shown can be attained, and the treatment charges of the ore schedule must be based not alone on the expense obtaining in the actual smelting operations, but on the technical considerations governing possible metal recoveries as well. Ores known as fluxing ores, and without which the latter could not be smelted, have the lowest treatment charges applied to them regardless of the smelting expense, while other ores which demand fluxing ores in smelting have to bear greater smelting charges. This is a natural as well as a commercial distinction, for the fluxing ores are, almost without exception, low grade, while the silicious ores are generally of higher value. Therefore, smelting schedules must apparently become more complex with increasing complexity of the ore to be treated. It is impossible to frame the schedules in a manner which will readily be understood by those inexperienced in ore production and ore rates, and those unfamiliar with the mining and smelting industries.

Notwithstanding the continued efforts on the part of milling and smelting companies to extend aid to the mining industry in Colorado, the result has been a continued recession from the high level of prosperity which it occupied a decade ago. The extraordinary decline in production for this period will be seen from the following comparison:

	1900.	1909.	Decline, %.
Gold	1,400,000 oz.	1,061,000 oz.	24.21
Silver	20,300,000 oz.	8,900,000 oz.	56.16
Lead	82,137,000 lb.	32,360,000 lb.	60.60
Copper	No change.		
Zinc	Increasing in output.		
Total decrease in value	$50,314,000 to	$30,916,000	38.55

Colorado's ability to maintain its gold production even on the present level has been due alone to continued reductions in treatment charges, those on Cripple Creek ores having been reduced in the last ten years about $5 per ton on the average. The efforts of the smelting companies to check the decline in production of the silver-lead ores have been entirely unavailing, notwithstanding reductions in treatment charges aggregating on this class about $3 per ton. Not only have the heavy reductions in treatment charges not resulted in the maintenance of the former tonnage production, but with the steady decline in the mineral output, the American Smelting & Refining Co. has been obliged to put one-half of its Colorado plants out of operation and operates the remainder on curtailed capacity.

It is true that prospecting in Colorado has practically ceased for many years; that the orebodies which heretofore furnished ore for the smelters have been exhausted to a large extent, or are approaching that stage; that to a large degree mining properties once operated under company management are now worked by lessees, and that in most cases development work is being neglected; and finally, that in closed mines where orebodies have been exhausted, or only ore of too low a grade is left, or where such physical disadvantages as the necessity for an ore concentration plant or a heavy pumping equipment has to be faced, the investment of new capital is demanded. Such capital, however, will not be forthcoming unless it is made clear to the investing public that Colorado still offers a profitable field for mining ventures when undertaken and guided by competent and conservative management. The desired end can only be accomplished by co-operation all along the line, between mining, milling, and smelting interests, railways, and by the press in inviting mining investors to come to Colorado with the assurance of square and fair dealing on the part of ore-purchasing concerns.

Colorado's metallurgical engineers, that is, those who have acquired their initial experience in this State, have indisputably stamped their individual equations on metallurgical progress the world over. It was their efforts which have wrought success in the mineral fields of South Africa, New South Wales, and Australia. It is to them that the astounding and astonishingly successful copper milling and smelting methods in Montana and Utah are due. It is they who have placed the chlorination and cyanide practice of the Cripple Creek field on a higher

plane of metallurgical achievement. It is they who have created a practice of silver-lead smelting which is acknowledged as one to be patterned after in other States, and it is they who are now utilizing to the best and largest extent our present mineral resources and who may be trusted satisfactorily to take care of those which our pluck and energy may yet bring to light.

If indications point aright, there is reason to believe that our mining conditions will greatly improve in the near future. With the deep-drainage tunnel practically completed at Cripple Creek, new and increasing tonnages may be looked for from that section; with the discovery of important bodies of zinc carbonate at Leadville a new impetus will be given to enlarged development and operations in that district, which in truth furnishes the basis of our smelting industry; and with the renewed activities in those two districts and an advancing price of silver, we may confidently expect an awakening and quickening in all of our other mining camps.

THE OUTLOOK FOR ZINC

The zinc situation is attracting a great deal of attention. Consumption of spelter has more than doubled within the past ten years. When the expansion first began to make itself felt, a large number of zinc smelters were erected in Kansas, where they were near the lead and zinc mines of Joplin and Baxter Springs, and where a cheap supply of natural gas could be had. The exhaustion of the natural-gas fields is apparently near at hand and the retorts in the Kansas field will soon be forced to close. Of 94,000 retorts in the country, 50,000 are in Kansas, and of these, 30,000 are in or near the Iola field, where the gas supply is already so far diminished as to put half of the smelters out of operation. The balance are soon to face the same conditions. Coal smelters, operating 5000 retorts, have for one reason and another been shut down, with the result that the total capacity now available is not more than 70,000 retorts under the most favorable conditions, which means a production of 200,000 to 225,000 tons, as against a normal output of 275,000 tons. The only solution of the problem is a probable reversion to coal smelters and the erection of new plants. To do this will require the greater part of two years. In the meantime, higher prices for spelter are predicted. East St. Louis, which is the spelter market, is quoting $5^3/_4$ to $5^7/_8$c., and 6c. is predicted in the near future.

Placer claims located to secure tailing deposited thereon, or passing down the canyon, can only be taken on unappropriated land. If the tailing is on a quartz location no other than the owner can go upon the claim and appropriate the tailing, as a stranger would be a trespasser with no right to place stakes on such quartz claims. It may be that some method can be applied which would cause the tailing to be carried down stream to land where it would be available. The better way would be to secure a lease from the company owning the tailing pile, and work it under royalty.

Gravel Elevation in Siskiyou County, California

By Charles S. Haley

Although it is generally known to the mining fraternity that a large portion of northern California is unaffected by the debris law with regard to hydraulic mining, nevertheless that portion which may be briefly described as that country which is tributary to and drained by, the Klamath river, has not been very extensively advertised or examined in the last two decades. This region, comprising a large part of Trinity county, the northern half of Humboldt county, the eastern portion of Del Norte, and almost the whole of Siskiyou, has for many years been a steady and prolific source of placer gold. It is of some of the more recently applied methods of handling the deep-channel gravels that it is the purpose of this article to treat; more especially of methods in use in Siskiyou county. In the early history of the State, the camps of Rough and Ready, Scott's Bar, and Happy Camp, on the Scott and Klamath rivers, as well as Sawyer's Bar, Forks of Salmon, and Some's Bar, on the Salmon river, poured forth their golden stream through the agency of every nationality in the world. Chinamen by the thousands, negroes, Portuguese, Indians, Frenchmen, and Yankees, all lived more or less peaceably side by side. It is estimated that 35 years ago there were 3000 people mining between Forks of Salmon and Some's Bar, a distance of 20 miles. The South Fork and the North Fork of the Salmon had also their separate quotas, and though the country was destitute of wagon roads, and all machinery and supplies were packed in on muleback (as they still are today to a large extent), nevertheless, the country was prosperous. But the day of the wing-dams and of the ground-sluice is over. Conditions at present are very different. The easily worked gravel, with light top and accessible to water, has gone. The day of the giant, however, is still in its prime, and the difficulties incident to working on a large scale are ever present in this as in all other branches of mining. Perhaps the most difficult phase of the work in these districts, as in others, is the handling of the low bars, many of them ancient channels below the bed of the present river. A bar of this sort must, of course, be rich in order to pay for the expense of handling, even when operated on a large scale. In order for the tailing to be removed as fast as it comes through the boxes, it is necessary that the gravel be elevated. In the early days this was accomplished by the employment of gangs of men with pick and shovel, who threw the gravel up from one staging to another. This slow and laborious method is too cumbrous and costly for the modern mining corporation, therefore mechanical ways have been devised.

First, and simplest of all, is the plain giant elevator. If the channel, or depression in the channel, slopes up gradually to the head of the boxes, and the hole is not too deep to drive conveniently, one giant may be continuously employed in driving,

while another giant is running off the surplus water through a wooden trough or string of pipe leading from the bottom of the hole over the rim to the river. If pipe is used, the pumping giant is usually fitted with a gooseneck, leading up into the drain pipe. The suction draws the water off as fast as it comes back from the driving giant, permitting the latter full play to drive the gravel to the head of the boxes. A strong flow of lead water is, of course, kept running through the boxes all the time. This method of elevation is the simplest known, and is only practicable where the bedrock slopes off gradually and not to a great depth.

In cases where the depth is greater, and the slope abrupt, a pipe elevator for the gravel is sometimes used. This is more particularly used where the gravel is of medium size. A hole is worked out to greater depth than the rest of the channel, and all gravel of smaller size is driven into it, the larger

Fig. 1.

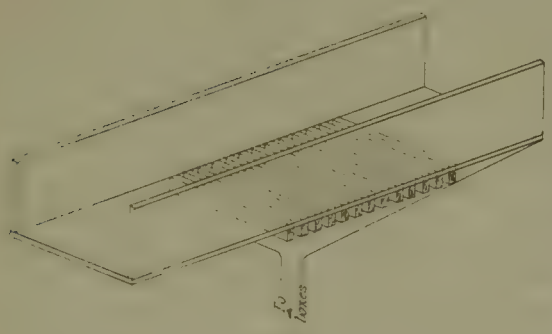

Fig. 2.

boulders being taken out with a derrick. Into this hole, and reaching to the bottom, runs the feed pipe. At the bottom end is a grizzly, to prevent congestion by the larger rocks. As shown in Fig. 1, the upper end of the elevator pipe dumps directly into the boxes. About six or eight feet from the lower end of this pipe is an intake-pipe, a couple of inches smaller, with a nozzle, so arranged as not to impede the flow of the gravel. The auxiliary pipe supplies the pressure for the pumping, and the suction at the bottom of the hole draws all the gravel that will go through the grizzly into the feed pipe. When the hole is filled with the larger gravel, it is cleaned by hand.

The third method with which I have to deal is perhaps the most effective of all, when used under proper circumstances, in connection with a derrick. It consists of an inclined chute, at an angle of 20 degrees, lined with steel. In most cases the width is about 12 ft., with a length of about 40 ft. The entire trough is lined with heavy steel plates, to prevent wear. The floor joists are 8 by 3 in., and after the first 15 ft. the solid steel plate changes to a steel-covered grizzly, the joists being set about 3 in. apart, the upper surface of each joist being covered with a 3-in. piece of steel, and a second steel-lined solid bottom being placed underneath, with a slope toward the boxes, which are placed directly underneath the point where the grizzly begins.

A head of lead water is kept running through the boxes. A pump of the kind first described, with an auxiliary giant, may be used to drain off the back water from the driving giants. One giant is used for cutting down and driving to the front of the elevator. The derrick handles the larger boulders. A giant is stationed in front of the elevator, and it drives the whole of the gravel up the incline. By the time it has passed over the 25 ft. of grizzly, all but the coarse rock has dropped through the grizzly and gone through the boxes.

The disadvantage of this method is that the elevator, though mounted on a track, with skids for rollers, is so cumbersome as to make the necessary removals in the natural course of working extremely difficult. This mode of elevation is, notwithstanding, perhaps the most widely used in that part of the country.

HORSE-POWER PER TON OF ORE TREATED PER DAY*

Type of mill.	Mesh.	Hp.
Stamps and vanners	20—40	0.75—1.0
Coarse concentration	10—20	0.5 —0.8
Combination stamp	16—30	1.5 —1.75
Chloridizing stamp (dry)	to 16	2.0 —2.5
Chloridizing stamp (wet)	to 40	4.0 —4.5
Magnetic separator		0.25—0.5
Cyanidation (dry) roll-crushing	20—30	0.5 —0.8
Cyanidation (wet), stamp crushing and sliming	to 80	0.75—1.5

*J. A. Barr, 'Testing for Metallurgical Processes.'

Where a prospector has discovered valuable mineral on railroad land, if the railroad company has not been granted a patent to said land, the discoverer of the mineral may legally locate mineral claims thereon, but must prove, if suit be instituted, that the land is more valuable for mineral than for agricultural purposes. If the railroad company has patent to the land the best way to do is to drop the whole matter, as it is a most difficult and expensive thing to set aside a Government patent to land. On February 26, 1897, Congress provided for commissioners to determine the character of railroad lands in Idaho and Montana, this referring to the odd-numbered sections. This commission has hearings, and reports its determinations to the land department. Its classifications, however, are only final when passed upon and approved by the Secretary of the Interior. Where land is classified as mineral by the Department of the Interior the railroad title to such land is cancelled. Work done on a placer situated on an unpatented quartz claim cannot be counted as annual labor on the quartz claim.

Sheet rubber, hose, packing, and other rubber material will cut much more readily if the knife be wet first.

Origin of the Placer Gold of Guiana

By Lee Fraser

There is a general consensus of opinion among those who have studied the geology of the Guianas as to the origin of the placer gold and the manner in which it has been concentrated in the so-called alluvial deposits of those countries. They consider that the gold has been derived from masses of acidic rocks or concentrated from that disseminated through the mass of metamorphosed basic rocks, now altered to amphibolites, epi-diorites, and hornblende schists, or in part contained in veins, or threads of quartz, which in places are abundant in them, or from the minute amounts of the metal disseminated through unaltered gabbro and diabase. De Launey has stated that in French Guiana gold is often associated with diorites, which in places have decomposed, forming auriferous earth; and in the contested territory between French Guiana and Brazil, M. Bernard found gold in veins of quartz in diorite traversed by veins of granulite, the diorite being intrusive in the gneiss and hornblende-schist. E. R. Lunquitz[2] produced proofs of great importance in connection with the hypothesis of the derivation of the gold of the placers from the country-rock (aplite) at Omai, B. G. Further he has written that there is no gold district in Guiana without diabase, and the richest portions of the Guiana gravels are characterized by the fact that the fissures in that neighborhood, originally filled with diabase, have been again disrupted and occupied by aplite or diabase intrusions. The result was a thorough shattering of the hanging and foot-walls of these dikes, the filling of the adjacent fissures by quartz, and the enrichment of the fahlbands by gold ores. M. Levat[3] has pointed out that the placer gold of French Guiana has been derived from the decomposition of diorites and other greenstones. As far back as 1873 these rocks had been demonstrated to contain minute quantities of gold.[4] T. B. Harrison,[5] in considering the geology of the northwestern district of British Guiana, claimed that the placer gold and much of the precious metal in the auriferous quartz veins in that district are derived from the minute particles of gold disseminated throughout the basic rocks. He also says that the source of the gold in the Essequibo, Potaro, Konawarook, and Demerara river goldfields, is generally due to the intrusion of diabase. But it has also been derived from hornblende-schist and epi-diorite. Later, in the Cuyuni and Mazaruni districts, further proofs were adduced as to the derivation of placer gold by concentration of the minute amounts present in the rocks during their degradation to saprolite and to concretionary ironstone or to more or less ferruginous gravely clays. Exception has been taken to the statement that the gold occurs in the unaltered diabase and gabbro, it being argued, in accordance with the views of Lunquitz, that "the gold depositions follow the weakened and ruptured zones of certain pressure planes in the basic dikes, in their contact with the older acidic rocks or commonly through both." In French Guiana, Levat has emphasized the close proximity of the placers to intruded granite masses. Harrison has stated that the granitic areas themselves are characterized by the absence of placer deposits upon them. In British Guiana, Harrison has not found sufficient proof to enable him to accept the view of the inter-relation or dependence of the auriferous districts upon the intrusive granite. Levat, after examining amphibolite and hornblende-schist for the presence of gold, states that from two samples not showing free gold he obtained 1 dwt. and 1½ dwt. per ton respectively, while from a sample showing free gold he obtained 15 dwt. per ton. G. C. Du Bois,[7] in considering the goldfields of Dutch Guiana, has pointed out that gold is noticeably present in the saprolite originating from amphibolite, and from augite-plagioclase rocks, being a concentration of gold from the original rock; also, samples taken from various diabases have given him from 3 to 9 grains of gold per ton. Harrison has found gold in the diabase varying from traces to 17 gr. per ton, while samples taken from diabase in contact with acidic rocks, yielded gold at 26 gr. per ton. Lunquitz has found gold in various rocks, among which are diabase and gabbro. Samples of epi-diorite, amphibolite, and hornblende-schists have all yielded gold at rates between 3 gr. and 2 dwt. per ton. At variance with this, Phillips and Louis[8] state that in British Guiana "quartz veins occur mostly in metamorphic schists and gneiss and nearly all the streams and rivers that traverse regions occupied by the above rocks, or by granite, are gold-bearing." J. E. Spurr[9] arrives at the conclusion that in British Guiana the deposition of the gold ores represents one of the closing phases of the great granitic intrusions, and that the basic dike rocks with which the gold ores are associated, as well as the silicious dike rocks in connection with which they are also frequently found, are representations of the general process of granitic injection, earlier than the veins, but subsequent to the main intrusion. Harrison states that his observations tend to prove that the occurrence of placer deposits, veins having gold-bearing quartz, and masses of mineralized rocks, are characteristically accompanied by the effects of dynamo-metamorphic forces, and are governed by dikes of basic rocks, either the gabbros, epi-diorites, or hornblende-schists, or the unaltered diabase.

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[1] Synopsis of Chap. XXV, 'Geology of the Goldfields of British Guiana', by J. B. Harrison, 1908.

[2] Contribution à l'Étude des Gites Metallifères, Paris, 1897.

[3] Uber die Riegionalen Veranderungen der Goldlagerstätten, 1899.

Annales des Mines, Recherche et Exploitation de L'Or en Guyane Française, 1898.

[4] Annales des Mines, Recherche et Exploitation de L'Or en Guyane Française, 1873.

[5] Joint report with Perkins, Commissioner of Mines, British Guiana, 1897.

[6] British Guiana and its Mining Development, *The Mining Journal*, 1904, E. G. Braddon.

[7] Geologisch-bergmannische Skizzen aus Surinam, 1901.

[8] 'Ore Deposits'.

[9] 'Ore Deposits of the Silver Peak Quadrangle'.

Under the conditions prevalent in the Guianas, and in other parts of the tropics where constant high temperatures associated with very heavy and frequent rainfalls cause a rampant growth of vegetation, igneous rocks of all types are subject to relatively rapid decomposition. The insoluble products of this decomposition, wherever shielded from erosion by forest growth, remain in place as a protective cover to the deeper-seated rocks. Under favorable conditions, this covering material attains a depth of 200 ft. Basic rocks of the diabase-gabbro type are readily subject to chemical decomposition under tropical conditions. The action being almost purely chemical, affects the sheared members of the group, such as the epi-diorites and hornblende-schists, in which the numerous planes of foliation allow ready access to the interior of the mass, more than it does with the massive members (unaltered gabbro and diabase), which yield only on their bounding surfaces and along their relatively few joint planes. The resultant products of this decomposition consist in buff-colored, red, brown, and chocolate-colored ferruginous, usually silicious earths and clays or laterites. Numerous instances are cited as to the extent of the solubility of gold, contained in the country rock by the soil-waters. Lunquitz has shown that the ashes of the trunks of trees that had grown on the gold-bearing saprolite in the district of Omai, B. G., contained small quantities of gold, varying from 2 to 10 gr. per ton of ash from wood at the base of the trunk, to 28 gr. per ton from ash near the first branches. Harrison subsequently performed a similar experiment for the purpose of verifying the data obtained by Lunquitz and secured corroborative results. He found that the ash from the bark of the tree contained 1 gr. of gold per ton of ash, while from the interior of the trunk he obtained from 7 to 10 gr. The water of Omai creek was also found to contain gold in solution. Various observed phenomena may be interpreted as accounting for the concentration of gold, in placers, veins, and mineralized masses, upon a basis of both mechanical and chemical action. The decomposed rock, saprolite in many places, because of the minuteness of the particles composing it, is highly absorbent of water, and when saturated, has the consistence of a viscous liquid, transmits hydrostatic pressure, flows more or less freely under the influence of gravitation, and permits the settling through it of grains and particles of the heavier minerals which it contains. The gold-bearing saprolites situated high upon the hillsides afford striking examples of this action of mechanical concentration of the quartz gravels and heavier minerals, which sink to form a well defined layer at a point where the saprolite loses its viscosity. Lunquitz has stated,[10] as the result of years of experience in British Guiana, that "a great portion of the placer gold owes its existence to chemical concentration." In connection with the concentration of the gold the theory as proposed by Spurr, is well worthy of note. The older gabbro, wherever found unaltered, contains areas, and especially interstitial spaces or patches, of a micro-pegmatite composed of feldspar and quartz, and by far the greater number of specimens of diabase which have been examined show a similar structure, while in places the diabase passes into a quartz-diabase, or into an augite-granophyre, some samples of which are gold bearing. It is quite possible that the occurrence of gold in the basic rocks of the colony is more or less closely connected with the presence of the quartz-feldspar micro-pegmatite, and that the micro-pegmatite areas in the basic rocks may be examples, on a minute scale, of 'magmatic quartz veins' and may have served as the feeders of gold from the magma to the iron ores of the basic rocks. Varying quantities of oxides of iron set free during the decomposition of the basic rocks are reduced to or are already in the state of ferrous iron, and, becoming dissolved in percolating waters, move through the mass of the laterite. A part of it may exist in solution as ferrous bicarbonate, and this, when brought under conditions where that compound becomes disassociated, is thrown out of solution and oxidized, forming coatings and layers of limonite. Other parts are held in solution by the organic acids of the surface waters and may be leached out of the laterite, but as the solution undergoes oxidation with the attendant destruction of the acids, the oxides of iron are deposited as limonite. The limonite either forms pisolitic grains or, more commonly, surrounds grains of sand, binding them together where abundant, into ferruginous sandstone, or where they are less abundant, using them as nuclei for the formation of masses of impure concretionary ironstone. Some of these masses are of great size and form blocks largely exceeding a ton in weight.

It is a common occurrence in auriferous districts of Guiana, that large areas of the sides and tops of hills composed of basic rocks are covered with gossan. The surface layers and the great blocks of concretionary ironstone generally form ruddy colored cindery-looking masses with numerous small cavities. As a final step in the local degradation of the rock, the products of its decomposition are washed from the side slopes to be re-arranged in the ravines and valleys as beds or deposits of gravel, ironstone, or ferruginous conglomerate. During the decomposition of the country rock the gold therein contained is dissolved in the soil-waters to be later re-deposited in fissures or cracks, or upon already existing particles of gold, or concentrated in the ironstone. In this resumé an attempt was made to elucidate the phenomena of the origin of the gold in the veins and placers of tropical countries, and in summing up the facts, hypotheses and theories herein presented, it is concluded that gold occurs disseminated throughout the country rocks; that under the action of the surface waters these rocks suffer rapid decomposition due to the chemical qualities of the waters; that among these products of chemical decomposition is gold dissolved in the surface waters; and that this gold, in solution, is chemically and mechanically concentrated to form gold-bearing deposits.

[10] *The Mining Journal, Railway & Commercial Gazette*, London, 1900.

Porcupine, the New Gold Region of the Far North

Canada has within recent years supplied her share of mining excitement. Rossland, in British Columbia, has been a famous copper-gold camp. Cobalt, Ontario, has developed wonderful mines of silver, and now Porcupine, in the far north country, well up toward Hudson's Bay, is attracting world-wide attention to what appears to be phenomenal gold-bearing veins. *The Canadian Mining Journal*, with commendable enterprise, has fully described the trail into Porcupine, and the geology of the new goldfield, in its issues of October 15 and November 1. Both articles, written by R. E. Hore, are profusely and handsomely illustrated, and contain much of interest and value to those seeking knowledge of this newest Canadian gold region. Following is a description of the Porcupine goldfield, from the issue of that journal of November 1:

The gold at Porcupine occurs chiefly in pyritic quartz. In lesser amounts it is found in the country rocks. The quartz in most cases is white in color, with reddish-brown patches of iron oxides. Less commonly, but including some spectacular veins, the color is grayish blue. The gold is, in part, coarse and readily visible to the eye. In most of the quartz, however, it is very fine. The greater part, 50 to 65%, is readily won on crushing. A smaller percentage is more intimately allied with sulphides and will probably be treated by cyanidation. The country rock is usually either pyritic gray schist or rusty weathering mixed carbonates. Less often it is a conglomerate. The schistose country rocks are for the most part altered volcanics, and are of various types. Many are sericitic and all are impregnated with carbonates. Small cubes of pyrite are usually abundant. Copper pyrite occurs; but in subordinate quantity. The carbonate rocks are gray to yellowish gray, crystalline, and massive. They are iron-calcium-magnesium carbonates, such as are common in the iron formations of Ontario and the Lake Superior States. Such rocks range in composition from siderite through ankerite to dolomite, and on the iron ranges are called ferro-dolomite. The percentage of iron in the Porcupine rocks, as in most Keewatin carbonates, is less than in normal ankerite. The conglomerate is composed of light colored pebbles of various types set in a fine gray colored matrix. An arrangement of the pebbles with their longer dimensions parallel, gives a decided schistose appearance. The deposits vary greatly in shape. Some appear at the surface to be well defined single fissure fillings or veins. In some cases there is a series of fissure fillings running nearly parallel and enclosing large and small masses of rock. These are conveniently referred to as vein systems. In another type numerous quartz veins run through ferro-dolomite beds. There are also large quartz masses of irregular and unknown form, which cannot be well designated as veins or lodes. They appear to be lenticular rather than tabular in shape. From the nature of outcropping surfaces, they have been called 'domes.' Until their true character is known it seems best to refer to them as quartz masses. These four types may be illustrated by description of four claims in Tisdale township. For a single quartz vein take one on the Connell property. A system of quartz veins is exposed at the Timmins mine. The most striking example of quartz ferro-dolomite lode is the Foster. A remarkably large quartz mass or 'dome' is that at the Dome mine. None of these deposits has been thoroughly explored, and observations on their nature must therefore be confined almost entirely to superficial characteristics. The Dome is being tested by drifts and cross-cuts at the 60-ft. level, and by diamond-drilling to a few hundred feet. One of the veins at the Timmins is being driven on at the 100-ft. level. The Foster lode and the Connell vein have each been carefully stripped, but neither has yet been tested for more than a few feet in depth. The deposit selected as an example of this type is on the Connell claims, just south of the centre of Tisdale township. The vein has been exposed almost continuously for over 200 ft. At the western exposure it is 15 in. and at the eastern, where it dips into low ground, 5 ft. wide.

The quartz is milky-white and vitreous. Where it has been directly exposed to the weather, it is coated with yellowish brown iron oxides. Streaks and patches of this secondary material are found filling small cavities and crevices for a few feet downward. Portions of the vein which were protected by a mantle of soil, show similar alteration, but to a much less degree. Some such portions show scarcely any weathering and appear brilliantly white in the sunlight. Free gold can be seen for several feet along the vein. It is coarse and readily detected by the naked eye. The most spectacular and richest portion is a streak about 15 in. wide on the north side of the vein. Here countless particles of coarse gold appear on the surface. It occurs especially in rusty cavities and in minute dark streaks, which fill crevices in the quartz. The gold particles are even more numerous, however, on the vein-wall. This wall is clean cut, and has a thin selvage of dark greenish color. It is slickensided and shows pronounced grooves running nearly vertical. These grooves, running normal to the undulatory strike, produce a decidedly corrugated surface. The wall rock is a rusty-weathering ferro-dolomite. At the immediate contact it is disintegrated for a foot in depth. A foot or more from the contact it is quite massive, except for a few inches at the surface. The fresh rock is of light gray color, finely crystalline and soft. It effervesces slowly with dilute acid. Scattered through it are striated cubes of pyrite. Veinlets of white quartz penetrate in all directions. The carbonate on the north wall is only a few feet wide, and is succeeded by dark-colored, fine-grained porphyritic igneous rocks. South of the vein the rocks are not exposed. At the Timmins mine there are a number of large quartz veins striking in a northeasterly direction. Some of them are but a short distance apart and appear to converge and enclose large masses of rock. Others running parallel, and supposedly of the same vein system, are 200 and 400 ft. apart. The larger

members of the system themselves enclose numerous fragments of schist similar to the country rock. This vein system appears to be part of a larger veined zone, which extends northeast to and north of Pearl lake. The quartz is in most of the veins white in color, except where stained brown with iron oxides. An exception is a vein of grayish blue color, which cuts across one of white quartz. The veins are commonly 4 to 10 ft. wide, and one vein, now being developed from two shafts 250 paces apart, is 8 to 15 ft. wide. There are a large number of veins which show free gold on the surface, generally in rusty patches or in minute fractures. The ore from a few feet below the surface is remarkably free from iron stains, and the pyrite crystals have scarcely any tarnish. Ore impregnated with particles of coarse gold has been taken from a drift at the 100-ft. level, and it is more spectacular than any of the surface showings. The workings are in ore at almost all points, and the ore is high grade. The wall rock is a gray pyritic sericite-schist impregnated with carbonates. The pyrite occurs both as small cubes scattered through the rock, and in less perfect crystals in little veinlets. C. W. Knight has suggested that the schist is an altered phase of quartz porphyry, which occurs in the vicinity. It is similar to, but not so silicious as, some of the sericite schists at Temagami, which Dr. Barlow showed to be mashed quartz-porphyry. It is as yet impossible to trace out the individual members of the vein system. Many of the outcrops are small and separated by low ground. The strike of veins on neighboring outcrops is frequently too divergent to permit the interpolation. Considerable stripping has been done and a few veins traced continuously for several hundred feet. A remarkable outcrop is the grayish-white quartz 'dome' beside which No. 1 shaft has been sunk. For the greater part it shows a marked similiarity to some marbles. In places it is stained with iron oxides, and in such rusty patches are many particles of coarse gold. The exact relation of this mass to the vein in the shaft is not evident. From the far side of the shaft-house, a vein 3 ft. wide, runs northeast for a few paces and then is lost in low ground. Several hundred feet along the strike another outcrop shows similar quartz. Southwest from No. 1 shaft there are fairly continuous outcrops of quartz, which are probably parts of one vein, and which have been tested by two shafts. From the farther shaft a drift is being made at the 100-ft. level toward No. 1. In some outcrops east of No. 1 shaft a variety of structure is shown by quartz veins in the schists. In some places the veins cut distinctly across the foliation of the country rock. In others there are veins of similar quartz which conform closely to the schistosity and terminate abruptly in the sharp folds. On the Foster claims, gold occurs in quartz veins which run through a band of rusty-weathering ferro-dolomite. The largest lode has been stripped for about 250 paces. It shows a width of 5 to 20 ft., and for a considerable portion of its length averages over 10 ft. The quartz stands out in relief from the more deeply weathered, red brown, oxidized ferro-dolomite. Several quartz bands, 4 to 10 in. wide, run normal to the strike of the lode, and the carbonate is impregnated with a multitude of small quartz veins. Many of the latter occur in two sets which divide the carbonate into small rectangular blocks. The quartz is white in color, but stained with iron oxides. The red rust comes partly from the oxidation of small pyrite crystals, which are abundant in patches of the quartz, and in part from the weathering of the ferro-dolomite. In some of the rusty crevices there are spectacular showings of coarse gold. The lode strikes nearly due west. The country rock is a pyritic gray schist impregnated with carbonates. At the Dome mine a smooth outcrop glistens white in the sunlight. It is chiefly made up of huge masses of quartz which enclose large and small fragments of gray schist. The country rocks are gray sericite schist, gray slate, and a schistose conglomerate. One mass, which is almost entirely quartz, has a surface area 100 by 200 ft., and there are numerous smaller masses of elliptical plan. An oval-shaped area, including much country rock, but of which about one-half is quartz, is 200 by 600 ft. In addition to the large masses, there are numerous veins one to three feet in width, which penetrate the country rock. Some of these are almost conformable with the schistosity, but many cut distinctly across it. The dome-shaped masses show rather varied relations to the enclosing rock. In some cases the contact is nearly vertical, while in others it is but gently inclined. The boundaries are seldom nearly straight lines, but elliptical or circular. Coarse gold shows at several places on the surface. It, together with pyrite, is especially abundant in the vicinity of enclosed schist or the country rock. A large tonnage of quartz carries workable quantities of fine gold. The pyritic schist itself is known to carry some gold. Small striated cubes of pyrite are abundant in both the schist and the quartz. Copper pyrite also occurs, but it is probably not in such quantity as to interfere seriously with the recovery process.

Photographs of head-frames, machinery, or frame work of any kind, where the photos are intended for reproduction in books or papers, should be taken on a dull day, or at a time when the sun is not shining directly on the object to be photographed. The bright sunlight will cast many confusing deep shadows, which lessen materially the value of the picture. Do not over print an exposure, as the detail is lost and the illustration fails of its purpose. Always aim to get a good exposure of the principal object, regardless of artistic effect. If a mill is to be illustrated, and a Mexican chances to come into view with a squeaking native cart, never mind the cart and driver—get the mill, then turn your attention to the Mexican outfit and get a good exposure of that subject. A great many pictures sent in for re-production—the majority, in fact—are practically useless, due to the various causes above referred to.

Zincblende may be readily detected by applying a drop of hydrochloric acid, which will at once cause the evolution of sulphuretted hydrogen, recognized by its odor, that of rotten eggs.

A Revolution in Mining Methods

By G. E. Worcester

No excuse is needed for presenting the following discussion, nor for proposing a rather radical departure from present accepted practices and ideas. The excuse already exists in conditions which prevail in nearly all metal mines throughout the United States and throughout the world. In our day we are related to pride ourselves upon the advance which has been made both in mining and metallurgy during the past century, and there is indeed large grounds for congratulation. The invention of high explosives and their adaptation to the use of the miner in breaking rock, the development of the rock drill and later of the air hammer machine and other improvements have contributed toward lowering the cost and extending the field of mining operations. Undoubtedly the greatest factor in the advance made has been due to the use of high explosives, and in our day it is hard to conceive of mining operations carried on without their use.

We are told that in olden times rock excavations were made by building fires against the face of the rock and after heating, cooling the surface suddenly by the application of cold water. We would be apt to smile at the application of such a method today, and yet, in certain respects, the method now generally in use presents no very great advance over ancient practice. The physical conditions induced by the explosion of 50 lb. more or less of dynamite in the face of a drift are certainly no more conducive to a healthy condition of the atmosphere than are those produced by maintaining a fire against the breast. In either event the air is heated and contaminated by gases to such an extent as to be unfit for the maintenance of human or of any animal life. Where ventilation is good it is true that conditions quickly improve, but unfortunately in most metal mines ventilation is seldom good, or even approximately fair, except in certain portions of the mine. This is particularly true of the lower levels before connections can be made, and daily men are compelled to work under atmospheric conditions which are a disgrace to our boasted progress in mining methods. The casual visitor underground may not realize these conditions, but the man who does the work and who is compelled by force of necessity to grope his way through powder smoke so thick that he can scarcely discern the glimmer of his candle, and who is compelled, with smarting eyes and throbbing head, to proceed to the face of the drift or raise and there make ready to repeat the torture for the benefit of the succeeding shift, realizes them to their fullest extent.

I am aware that any proposition looking to a departure from accepted methods must appeal to those who pay for the work, and then from an economic rather than a humanitarian standpoint. The manager of the mine may be interested in the physical condition of the men whom he employs, but his first care is usually on the financial side of the question. Men are usually easy to obtain, costs are [illegible] hard to reduce.

Any radical departure from accepted practice [illegible] it may hope for general or even partial acceptance must show an improvement in one or more of the following aspects. A reduction in working costs, a larger percentage of ore recovered, a decrease in the amount of waste necessary to handle, or an improvement in physical conditions or a decrease in the danger involved. The first three of these conditions might be more properly included under one general heading of "more economical ore extraction." It is here proposed to consider a method which offers possibilities of advancement in not only one but in all of these conditions. It is not the purpose to present this as a complete discussion or as a method capable of immediate adoption, but rather as the foundation for more complete and extended investigation.

So far as I am aware the idea is original, yet it involves no new principles, only the application of old ones to different conditions. The increased use of power, together with a lowering in its cost of production and the development and perfection of rock cutting machinery are two main factors which seem to render possible the adoption and use of the method to be described.

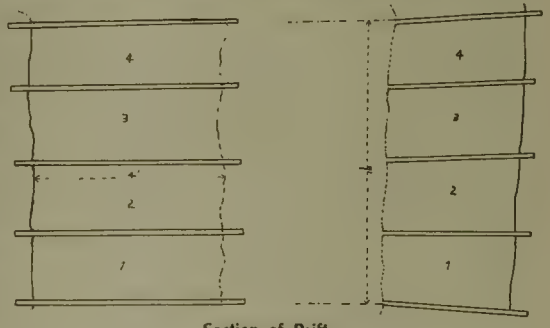
Driving or Tunneling.—The accompanying sketch represents in longitudinal section and plan the face of a 4 by 7-ft. drift, such as is ordinarily driven in development. In this case it is assumed that a 3-ft. round is to be broken and the rock removed from the face. The operation begins by cutting a channel at the bottom of the drift extending its full width, or as much wider as may be found necessary. This cut is made slightly deeper, say 6 in., than it is expected to break the ground. Following this the second channel is cut in similar manner at a distance above the first, depending on the character of the rock to be broken. After the completion of this channel, wedges are driven by pneumatic power into the second channel to break the block of ground between the two channels, which would have to be removed on account of the lack of space at the bottom of the drift. The amount of rock broken between the two channels would depend upon two factors; first, the character of the rock, and, second, the power of the pneumatic machinery employed in breaking. In the sketch it is assumed that five channels would be necessary for the whole breast, making the blocks each a little less than 21 in. thick. After the removal of the first block, the others follow in a similar manner, except that after the first block is removed it should be possible to insert a trolley or car under the succeeding blocks to catch the rock as it is broken. In this manner the shoveling of from one-half to three-fourths of the rock broken may be avoided, resulting in a material saving. In the driving of large tunnels several machines could be simultaneously employed and the percentage of rock that could be removed without shoveling could be greatly increased.

For a 4 by 7-ft. tunnel, as illustrated, from 60 to 85 sq. ft. of channeling would be necessary, depend-

ing upon the amount necessary above the required dimensions. In driving in vein matter a seam will ordinarily be followed for one or both walls and present a line of weakness beyond which it would not be necessary to channel. In the sketch it is assumed that the channels extend 6 in. into each wall, and this assumption gives the larger figures here quoted. These figures will form the basis for estimating the probable costs.

In shaft sinking it is assumed that at least two machines will be employed, one or more in each end of the shaft. The central block is in this case removed first and presents the most difficult part of the work, in that the rock must be removed as broken. After the removal of the central block the others follow toward the ends and are removed as broken. It is assumed that mucking and breaking will proceed simultaneously, so that the bottom of the shaft will be cleared for another round almost as soon as the preceding one is broken. An interesting feature suggests itself in the possibility of avoiding a large proportion of the mucking by breaking the rock directly into especially prepared receptacles, which may then be hoisted a short distance and dumped directly into the regular hoisting bucket or skip. As no blasting is done, timbers may be kept directly up to the face and platforms provided for the placing of tools out of the way of the workmen. In blasting for a shaft the dimensions that will be broken are always uncertain, which results in the use of an excessive amount of timber and makes the operation of placing it difficult and laborious. With the excavation cut to proper dimensions a considerable saving of blocking can be secured and a further saving in the labor of placing timbers, as well as a considerable saving in the amount of muck to be hoisted. For the breaking of a 3-ft. round, from 144 to 196 sq. ft. of channeling would be necessary under the conditions assumed for driving. With two machines in operation this would mean from 72 to 98 sq. ft. for each machine.

In raising but one machine is employed, and breaking begins in one end and proceeds toward the other. In this case some provision must be made to prevent the rock from striking the machine. In the breaking of the first blocks the channels are cut at such an angle as to cause the rock to fall to one side of the machine, but when the last portion of the raise is reached it is not possible to accomplish this. On this account the last portion is left until the next set-up and broken by cutting flat channels. The driving of a raise is always a difficult and expensive operation. Timbers are placed in position, usually to be broken by a succeeding blast, ladders lose their rounds, machines are constantly being sent to the repair shop, hose is cut by falling rock, air-pipes broken, men quit on account of bad air and hard work, and apparently all unwelcome conditions which may be expected in any part of the mine are particularly concentrated in the driving of a raise. With the elimination of the use of explosives one of the necessities of driving raises disappears, and where raises are desired for the blocking out of ore, many of the disagreeable features of the operation can be avoided by the channeling process. In a raise 4½ by 10 ft., from 103 to 149 sq. ft. of channeling would be necessary, assuming the channels to be 2 ft. apart centre to centre. In breast stoping an 8-ft. breast is to be broken to a depth of 3 ft. The channels in this case are all inclined upward to allow of more ready removal of the cuttings. It is assumed that the limits of the orebody are defined by slips so that channeling outside of these boundaries is unnecessary. Whether breast, overhand, or underhand stoping be employed would be simply a matter of individual preference, and the adaptability of the machine used to any particular method of attack. In overhead work it would be necessary, as in raising, to incline the channels away from the vertical in order to allow the broken rock to fall clear of the machine. In carrying an 8-ft. breast in a stope 6 ft. in width with channels 2 ft. apart, centre to centre, 84 sq. ft. of channeling would be necessary to break to a depth of 3 ft. This assumes that the channels are cut to a depth of 3 ft. 6 in. and do not extend beyond the sides of ore broken. Thus 108 cu. ft. of ore would be broken or assuming 12 cu. ft. of ore in place to weigh one ton would give nine tons of ore.



Section of Drift.

In breaking rock by the channeling method the question naturally arises as to whether or not the rock broken would be of a size which could be readily handled in the mine. If a block of rock 2 ft. thick, 3 ft. wide, and 4 ft. or more in length is broken out in one mass and allowed to fall down a stope or raise the result would undoubtedly be disastrous to any timbers which happened to be in the way. Such results are not to be anticipated, however. In breaking rock between channels by means of wedges and hammers the rock would be broken into fragments, the size of which could be largely controlled by the operator by varying the distance between the channels, and particularly by varying the depth of channeling before inserting the breaking tools. For instance, in the breaking of a 3-ft. round it is not necessary that a 3-ft. channel be completed before the breaking of the block begins. The channel may be made 1 ft. more or less in depth, the block of rock broken out, the channeling resumed, and this program repeated to the required depth. In this manner the size of the rock broken could be more readily controlled than it could by blasting.

In mining operations, and more particularly in tunnel work and shaft sinking the element of time is frequently of more importance than any other consideration. In this respect the channeling method

seems to offer possibilities which cannot be obtained by blasting. When a round of holes is shot in the breast the machinery employed in drilling must of necessity be removed to prevent injury by the blast. Time must be allowed for the clearing of the atmosphere, the muck must be shoveled back from the breast and the drills again set up before drilling can be resumed. Moreover, it is frequently found that the round of holes has not broken as anticipated, and a portion or all of the round has to be again blasted, resulting in more loss of time. On account of all of these conditions it is frequently found impossible in a 4 by 7 ft. tunnel to make an advance of more than 4 or 5 ft. in 24 hours even when three shifts are employed. In shaft sinking, provisions have to be made for handling timbers, tools, and men, and timbering must frequently be carried close to the bottom, and consequently it is constantly being broken or displaced. In the channeling method the necessity for removing the machinery disappears, and with it one of the most serious objections to the use of heavy machinery. If the machinery can be kept constantly in the breast, and can be manipulated by the use of power-driven appliances there is no material objection to any reasonable weight. The only problem that presents itself is that it be contained in a sufficiently small space to permit the expeditious removal of the muck. A machine capable of channeling 85 sq. ft. in an 8-hour shift and breaking the blocks as channeling proceeds does not seem impossible or even difficult to design and manufacture. Such a machine would give an advance of 3 ft. in 8 hours in a 4 by 7-ft. tunnel, or of 9 ft. in 24 hours. In a 6 by 12-ft. shaft two machines of the same power would give approximately the same results, and if the machines can be so designed as to operate in a space 3 ft. in width, it would be possible to use four machines, resulting in an increase of speed such as is impossible of attainment by the blasting method. The question of the removal of the muck would in this case be the most serious obstacle to rapid advance. To prevent the clouding of the atmosphere by dust some form of water attachment might be necessary for drilling uppers. For down-holes, or channels, water could be added in the usual manner.

Danger.—In underground work a large proportion of accidents is caused by falling rock, due to the effects of explosions of dynamite. Dynamite is therefore the prime cause of a large portion of accidents, whether from falling rock, premature explosion, or drilling into missed holes. If we dispense with dynamite, we eliminate the principal cause of accidents in underground work. A channeling machine is not a new nor an untried device. Such machines have been in use for years in quarrying and have been brought to a high degree of perfection. It only remains therefore to adapt the machine to underground conditions, adding to it other tools for wedging out the block of rock. Neither of these requirements seems difficult of accomplishment. As now manufactured, channeling machines are too cumbersome and unsuited in some respects for underground work. In the cutting of a channel across the face of a drift for instance it would be impracticable to operate the channel at its proper width by simply moving the machine back and forth across the face. The wall of the drift would interfere and besides provisions must be made for support of the machine. In my opinion the machine for the work will ultimately be a development of the air hammer machine rather than a modification of the present channeling machines. Such machines have conclusively demonstrated their superiority in cutting capacity, low air consumption, and less massive construction over the reciprocating type of machine. It is true that they have not been successful for down holes without the use of water attachment, but in the case of a channeling machine the difficulty of removing the cuttings largely disappears. In any event the use of a water attachment is highly desirable and should be a compulsory requirement.

Following is a resumé of the qualifications which such a machine must possess: it must be sufficiently powerful to channel 100 sq. ft. in an 8-hour shift and break out the blocks; it must be substantially built to prevent the necessity of frequent repairs; it must be contained in as small a compass as possible; it must be capable of being readily and quickly changed in position; it should be provided with a water attachment for settling dust; and it must be simple of operation.

Data usually supplied by machine manufacturers give results for channeling varying from as low as 2 or 3c. per square foot to as high as 50 or 60c., depending on the character of rock and conditions of work. Average figures range between 10 and 20c. per square foot, including all costs of labor and power. These results are obtained under conditions differing from underground work, but with a proper machine the cost would be in the neighborhood of 16c. per square foot. Adding to this a cost of 4c. for breaking would give a total cost of 20c. per square foot. Under this assumption the cost for breaking rock in a 4 by 7-ft. drift would be from $4 to $5.67 per foot of advance. For a shaft 6 by 12 ft. under the same assumption the cost would be from $9 to $13 per foot of advance. For a raise 4½ by 10 ft. the cost would be from $6.87 to $9.93 per foot. These figures do not compare unfavorably with results obtained by blasting, even without taking into consideration the saving in timbers and mucking that would be effected. Figuring that in a 4 by 7-ft. drift two men would be required to operate a machine and that a 3-ft. round could be broken, the results obtained would be about as follows:

Two men at $3.50 to $4 per shift	$7.00 to $8.00
Air at $4 to $5	4.00 " 5.00
Tool sharpening	0.50 " 1.00
Repairs, etc.	1.00 " 2.00
Total	$12.50 " $16.00

These figures correspond closely to those obtained by assuming a cost of 20c. per square foot for channeling and breaking. All of these figures are confessedly little more than speculation with the data now available, but I believe them to be reasonable and possible of attainment, or even of reduction.

Calculations of a Copper Blast-Furnace Charge

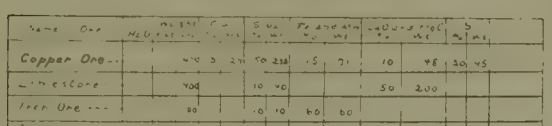
By James A. Barr

The problem is to select the best charge to smelt an ore containing SiO_2, 50%; Fe, 15; CaO, 10; S, 20; Cu, 5; gold 0.05 oz.; silver, 10.0 oz. under the following conditions: (1) furnace capacity 175 to 200 tons per 24 hours; (2) limestone close at hand; (3) iron ore must be shipped in 100 miles by railroad and contains no gold or silver; (4) coke obtainable at reasonable prices and of good quality.

Judging from the above conditions it would seem advisable to volatilize enough sulphur to make a converting grade of matte, to use as high a silica slag as is allowable by the size of the furnace, perhaps a sesqui-silicate, and substitute lime for the base as much as possible without making the slag too refractory. The table of slag formation temperatures shows that the lowest limit for iron is 21.6% without an undue rise in the temperature formation. The coke may be finally reduced on account of the sulphur available for fuel, but 14% should be used at first and reduced to the lowest possible limits with careful watching.

The methods of calculation are given in the following charge sheets and are performed in much the same manner as described in detail under the calculation of the lead charge. The data necessary for the computation are taken from the table and matter previously given.

CHARGE SHEET



*This may be increased to 1000 lb. by taking more copper, probably 485 pounds.

SLAG

	Per cent.
SiO_2	42.4
FeO	21.6 (Fe, 16.8%)
CaO	36.0
S	0.8
Cu	0.25

COKE (10% ash, 1.0% S)

Ash.	Per cent.
SiO_2	75.0
FeO	10.0
CaO	10.0

MATTE

	Per cent.
S	25
Cu + Fe	65
S (volatile)	80

FACTORS

$\frac{16.8}{42.4} = 0.4$ Fe factor.

$\frac{36.0}{42.4} = 0.85$ CaO factor.

*Abstract from 'Testing for Metallurgical Processes.' Published by the *Mining and Scientific Press*.

SLAG LOSSES

$\frac{298}{0.424} = 704$ lb. slag, 0.25% of $704 = 2$ lb. Cu slagged.

$704 \times 0.008 = 6$ lb. S in slag.

$96 \times 0.80 = 77$ " " volatilized.

83 " " total loss.

MATTE COMPUTATIONS

$13 \div 0.25 = 52$ lb. of matte.

$(22 \div 52) \times 100 = 42.3\%$ Cu in matte.

$298 \times 0.4 = 119$ lb. Fe needed.

120 " " present.

1 " " excess.

AVAILABLE IRON

$65 - 42.3\% = 22.7\%$ Fe in matte.

$52 \times 0.227 = 12$ lb. Fe in matte.

$298 \times 0.84 = 250$ lb. CaO needed.

249 " " present.

1 " " lacking.

These figures are near enough, but larger amounts should be corrected as done in the Lead Charge Sheet.

MATTE FALL

$\frac{52}{975} \times 100 = 5.3\%$ matte fall.

This is low and might well be increased at the expense of lowering the grade of matte.

Remarks.—If the corrections in the fluxes amount to much in the first estimate, say over 10 lb., the calculations should be gone over again. The charge may be increased to any quantity by multiplying all of the constituents by the necessary factor.

APPLICATION OF SLAG DATA

Since the basic problem is to select the best charge or slag to smelt a given ore or selection of ores, whether it is done for comparison of two methods or to determine the most economical slag, all resolve into the question, what mixture put into the furnace will yield the greatest net profit.

Example.—Given a collection of ores and fluxes whose analyses are given in the following tables:

	SiO_2, per cent.	FeMn, per cent.	CaOMgO, per cent	S, per cent.	Pb, per cent.	Cu, per cent.	Au, oz.	Ag, oz.
Lead ore	16	..	10	10	60	2	..	50
Silicious flux or ore	70	4	..	4	..	..	1	..
Irony ore	10	60	..	..	..	..	..	..
Limestone	3	..	54	..	..	..	..	..
Coke ash, 10% coke.	75	18	9	..	..	..	..	..

The lead ore is the one to be primarily considered, it being the output of the mine in question. The charge against this ore delivered at the smelter bins is $2 per ton. The silicious ore or flux may be readily obtained as a custom ore and a treatment charge of $6 per ton imposed, returning 95% of the metals to the seller. Limestone costs 75c. per ton delivered from the company's quarry, and irony ore costs $4 delivered at the smelter. First decide if any of the ores should be roasted. The only ore with an appreciable amount of sulphur is the galena. The one very prominent argument in favor of not roast-

ing is its high silver content. Since one unit of sulphur costs 2½c to handle, there in one ton of galena would be the following costs if not roasted:

10 units of sulphur at 2½c = $2.50 per ton

Charges if roasted	Per ton
Roasting H. & H.	$1.76
Losses Pb 4% of 1200 lb. at 1c*	0.48
Losses Ag 4% of 30 oz. at 50c	1.00
4 units of sulphur left at 2½c	1.00
Total	$4.24

*The 1c equals net profit that would ultimately be obtained if one pound of metal were recovered as market lead.

Difference in favor of not roasting, $1.74 per ton. This does not take into account any benefits from the use of a sintered H. & H. product. From the charge-sheet may be taken the quantities of ore and flux making up one ton of blast-furnace mixture and figures of profit and loss determined as follows:

PER TON OF CHARGE*

Recovery, Pb 93%, Ag 95%, Au 98%.

CHARGES

0.21 tons limestone, at 75c	$0.16
0.32 tons ironv ore, at $4	1.28
0.16 tons lead ore, at $2	0.32
Refining 0.046 tons base bullion, at $12†	0.55
Smelting 1 ton charge, at $3	3.00
Total charges	$5.31

*These figures are taken from the head charge sheet.

†The cost of refining is assumed to cover the cost of placing all the metals in marketable shape.

RECOVERY

192 lb. Pb, at 4c‡	$7.68
7.6 oz. Ag, at 50c.	3.80
Custom ore, 0.27 ton, at $6	1.62
Total recovery	$12.10
Charges	5.31
Profit	$6.79

‡Does not include freight to market.

Next the charge may be calculated with a different slag and estimates made of the profit with the more basic or acid type. Here inaccuracies creep in because, with the data available, it is not possible to determine exactly the decreased cost for smelting one ton of charge when using a faster running slag or to estimate without actual experiment the difference in the recovery of the metals. The cost computations are repeated with the new slag and the resulting net profit compared with the previous results and deductions drawn.

It will be noted that the gold content of the silicious ore is neither charged nor credited to the furnace charge. This will introduce a slight inaccuracy because this omission is based on the assumption that the recovery of the gold will only be the 95% which is returned to the ore seller. Since the recovery of gold is given as 98% there will be a difference of 3% in favor of the recovery, or about 16c. in this case, which is well within the limits of errors for the example.

Sixty years ago Overman, in his treatise on metallurgy, said that successful smelting was merely a study of slags.

GEOLOGICAL MAP FOR ARGENTINA

The Argentine Government being engaged in the construction and operation of railways where the climate and water resources resemble those of the southwestern United States has met with grave difficulties in getting sufficient and proper supplies of water. Engines imported at great expense and put in operation on western roads of the country have become useless after a very brief service, and as the railways are being extended in Patagonia further difficulty from this source is anticipated. Our Minister to Argentina, Charles H. Sherrill, saw in these circumstances an opportunity to extend a helping hand and called the attention of the able and progressive Minister of Public Works, Ramos Mexia, to the work of the U. S. Geological Survey and Reclamation Service. A plan for topographical and geological surveys, of the kind necessary to reasonable prediction of the occurrence of artesian waters, was prepared at the request of the Minister of Public Works by Bailey Willis of the U. S. Geological Survey, which, having been adopted, is to be carried out by Mr. Willis with the assistance of American topographers and geologists. The work is undertaken under a definite contract which runs for two years, and is independent of the Bureau of Geology and Mines which has been maintained for some time by the Argentine Government under the Department of Agriculture. This Bureau is manned chiefly by German geologists under the direction of an eminent Argentine, Señor Hermitte. It has done a large amount of excellent work in geologic exploration, but the results have been of comparatively little value because there are no topographic maps upon which to present the facts. It is expected that the surveys to be carried out under the Minister of Public Works will result in topographic and geologic maps of extensive areas. The first year's work has already been laid out in the neighborhood of the 41st parallel, south latitude, along the line of a railway which is being built from Puerto San Antonio to Lake Nahuel Huapi in the Andes. It will comprise not only the line of the road, but the territory on both sides of it to a considerable distance.

THE DIVINING ROD

In speaking of the divining rod Myron L. Fuller, in Water-Supply Paper No. 255 of the United States Geological Survey, says, "No appliance, either mechanical or electrical, has yet been devised that will detect water in places where plain common sense will not show its presence just as well. The uselessness of the divining rod is indicated by the facts that it may be worked at will by the operator, that he fails to detect strong water currents in tunnels and other free courses that afford no surface indications of water, and that his locations in regions where water flows in well defined channels are no more successful than mere guesses." The report can be obtained without charge by applying to the Director of the United States Geological Survey at Washington.

The Clays of Tennessee

By George H. Ashley*

An examination of the clays of west Tennessee, now being made by the State Geological Survey, has already convinced the State geologist that Tennessee offers exceptional opportunities for the development of a large industry in the manufacture of china-ware, sanitary and porcelain-ware of all kinds, glazed and encaustic tile, electric high-tension insulators and fire-brick, to say nothing of the great number of lower-grade products—ornamental, paving, and common brick, terra cotta, roofing, and drain-tile, and domestic ware. At the present time the State produces between one and two million dollars worth of clay products; mostly in the form of common building brick. It is in the manufacture of the higher-grade products that the State geologist believes there is room for great expansion. In the first place, the State has the necessary raw materials. Tennessee clays are being shipped in large quantities to Indiana, Ohio, Pennsylvania, and New York, in many cases supplying the largest part of the raw clay used.

In the second place, south, west, and southwest of Tennessee lies a great market at present obtaining its supplies from States to the north and east of that State, the raw materials being shipped from Tennessee to the potteries, manufactured and shipped back again to the State, or through it on its way southwest. In the third place, Tennessee is well supplied with shipping facilities, both by rail and water. To take a singe illustration: in 1891 a pottery was started in Evansville, Indiana, making semi-porcelain and white-granite table-wares. It uses ball-clay from Tennessee, kaolin from North Carolina and Georgia, feldspar from Pennsylvania, and ground flint from East St. Louis. In 1904 the output of that plant alone had grown to an annual value of $220,000 and gave employment to 300 hands.

Portions of west Tennessee are already dotted with great holes from which clays are being shipped. The clay beds range in thickness from 2 ft. or less to 18 ft. or more, sometimes in solid beds of uniform character, sometimes in a succession of beds of varying character, the individual beds being suitable for distinct uses. Thus, one bed may be especially suited to the making of saggars, the next underlying bed for white china-ware, the next for high-tension electric insulators, etc. As a rule the deposits are limited in extent to a few acres, but as a bed of clay ten feet thick and ten acres in extent will yield over 200,000 tons of dry clay, these little pockets in the aggregate could supply a large output, as indeed they are doing at present. As a rule the deposits have a rather heavy overburden, amounting, in some cases, to 30 or 40 ft., though the average for the pits now being worked will probably not run over 15 or 20 feet.

Apparently the main obstacle in the past to the establishment of clay plants in west Tennessee for the manufacture of high-grade wares has been the lack of trained labor, and the fact that the nearest coals, those from the west Kentucky fields, are too high in sulphur. It is probably true that a plant starting in that territory would have to import a certain amount of skilled labor. As the belt through which the best clays run follows the high divide between the Tennessee and Mississippi rivers—a region of fine farms, prosperous towns, rapid streams, and excellent health conditions, equal in those respects to most parts of Ohio, Indiana, and Illinois, the importation of such labor should present no difficulties. The fuel problem may be met by converting the coal into producer-gas and washing; by the use of oil from the neighboring Caddo oilfield, by the possible use of producer-gas from the beds of lignite found in the same region, or by the use of coal from east Tennessee. In the latter case it would require the bringing in of only coal enough for the kilns, as Kentucky coal could be used for power for the mills. Or the plants could be built at Nashville or some other middle Tennessee point within easy reach of the ball-clay from west Tennessee, the kaolin and feldspar from Georgia (if Tennessee deposits prove insufficient), and coal from the coalfield just east of the city. Nashville is naturally a distributing point with both rail and water facilities, and already has an encaustic-tile plant and other large clay interests. Considering, therefore, that the bulk of the raw materials of all kinds used in the manufacture of high-grade clay-wares is obtained from the South, it would seem that as much of those wares as may be needed to supply the Southern and Southwestern market could well be made there.

*State geologist of Tennessee.

The Mother Lode in California extends from the southern end of Mariposa county near the old village of Bridgeport to the northern part of El Dorado county. It is not a continuous vein or lode, but occurs as a series of nearly parallel veins or lodes, for most part with frequent, and in some instances, long interruptions within which no characteristic vein or lode occurs. The formations through which this great gold-bearing belt occurs are various. There are clay slates, ancient greenstone tuffs, and in a few places massive greenstone, both diorite and diabase; granitic rocks, serpentine, and much amphibolite-schist, the last a result of the alteration of the greenstones and greenstone tuffs. In some localities there are large zones of ankerite, a combination of carbonates of lime, magnesia, and iron. This material is occasionally found gold bearing, but with few exceptions only slightly so. A remarkable exception was found in the Rawhide mine in Tuolumne county, where the ankerite was found extremely rich, some of it milling $20,000 per ton.

Pyritic smelting was successfully practised at Mansfield many years since. It was first introduced into the United States on a large and successful basis by the late F. R. Carpenter at Deadwood, South Dakota, in the Deadwood & Delaware smelter, though small plants had previously been operated with indifferent success at Leadville and elsewhere.

Discussion

[illegible]

Superficial Indications of Ore Shoots in Depth

The Editor:

Sir—The contribution by William H. Storms in the issue of the *Mining and Scientific Press* of October 22, entitled 'Superficial Indications of Ore-Shoots in Depth,' has interested me greatly, as I had never before seen the subject discussed in print, or at least presented in such form. To me it seems that the gist of the whole article is contained in the first half dozen lines of his second conclusion, which reads: "Gulches or natural depressions crossing the strike of the lode, or vein, are the physical expression of disturbances beneath the surface, and it is rarely, if ever, that an ore-shoot will be found to extend from solid unbroken ground beyond such surface evidence of disturbance." I cannot recall in many years of mining experience where these 'rules' of Mr. Storms do not apply. It is a subject of great importance to the miner, and of earnest thought for the geologist, and I am surprised that there has not been some discussion of the matter heretofore.

I do not think it sufficient to say that I agree with all that was said by Mr. Storms, and let it go at that. The condition described is an effect, and it would be interesting to know the cause. If a gulch is an indication of disturbance occurring subsequent to the formation of an ore-shoot, the miner wants to know where and how to look for the lost portion of the faulted orebody. The region of disturbance beneath the surface where exposed by mine workings should be studied more closely with a view to ascertaining the direction of movement along the fault-plane. This knowledge would greatly facilitate the re-discovery of the lost ore-shoot. It is also possible that some gulches were not caused by disturbance beneath the surface, being the result of erosion alone. I may cite an instance of this kind occurring in the San Domingo gravel mine in Calaveras county, California, where a washed-out section of the channel exposes a line of fracture, or fault, showing the up-stream side of the bedrock to be from 4 to 6 ft. lower than that on the other side of the fault. The movement was vertical, as shown by the striations on the rock-walls of the fault. The fault extended up through the gravel to the surface, which where exposed was 50 ft. or more in height, proving that the disturbance occurred after the gravel was deposited. This fault-line can be traced several hundred yards to where it enters a gulch at an acute angle, and continues on up the gulch. The exposures on this line of disturbance indicate that the gulch above the point where the fault enters is on a line of disturbance, but below the place where the fault enters the gulch the latter is due entirely to erosion, the gravel having formed a dam there and caused the water in the gulch to cut a different course.

To apply the 'rules' to the prospective development of an ore shoot which apparently crosses a gulch it would be necessary first to determine whether the gulch was caused by a disturbance beneath the surface or whether it was merely the result of erosion. The miner as quickly as he gets below the surface, can hardly go a foot without encountering a seam or fracture of some kind. These we may call 'geological letters' next he meets with larger slips and faults, which may be considered as 'geological words', later he finds a horse, or runs against a dike, or some different kind of rock—the 'geological sentences.' These are the practical lessons to be learned by the miner as he toils slowly through the mountain. The article by Mr. Storms points toward an important geological lesson, and by collecting a few letters and words from the miners, and a few sentences from the geologists, and putting them in their proper places, something of value will undoubtedly be learned.

H. P. Gordon.

Oakland, California, November 19.

A Joke

The Editor:

Sir—The United States Civil Service announces an examination on December 7, 1910, to secure eligibles from which to make certification to fill vacancies as they may occur in the positions of mineral examiner in the Forest Service at $1800 per year.

We laugh at the development company that nowadays does not get the best expert advice about the orebodies it is developing or searching for. To neglect the study of faults, dikes, intrusions, occurrence of the ore, and even the mineral associations found in the ore and the gangue is as inexcusable today as is smelting by principles of guesswork instead of chemistry.

In selecting men for the important position of mineral examiner for the Forest Service, a man who has the say whether an entire region is to be opened up to exploitation and development, or to be locked up by a paternal government, we should expect the government to pick out the most talented experts, and for special regions to use men who have studied these regions. In deciding the possible mineral character of a district like the Mother Lode, who would be better fitted than Waldemar Lindgren or F. L. Ransome? J. E. Spurr, George H. Garrey, or S. F. Emmons know much of the rich late Tertiary type of gold deposits of Nevada and the West. In Arizona to decide on a probable mineral region, one must have studied the many varieties of limestone orebodies and their relations to intrusions and the structure of the country. If a disseminated copper deposit is inspected, much can be told from a field and then a microscopic study of the leached surface rock, etc.

To properly discharge its duty, the Forest Service cannot afford to get any but the best men for this work, regardless of the cost. Hence the joke mentioned at the top of this communication lies in the

following list of subjects on which the applicant will be examined:

Subjects.	Weights.
1. Spelling (twenty words of more than average difficulty)	5
2. Arithmetic (fundamental rules, fractions, percentage, interest, discount, analysis, and statement of simple accounts)	15
3. Penmanship (the handwriting of the competitor in the subject of report writing will be considered with special reference to the elements of legibility, rapidity, neatness, general appearance, etc.)	5
4. Report writing (test in writing in letter form a report of from 150 to 200 words in length, summarizing and arranging in logical order a series of facts included in a given statement of 400 to 500 words)	10
5. Practical questions (including surveying)	35
6. Training and experience	30
Total	100

GEOLOGIST.

Tucson, Arizona, November 18.

Red Tape

The Editor:

Sir—Six months' wallowing in a succotash of certificates and affidavits had weakened the engineer's mind. Too stupefied to realize that all the regulations had been complied with, that the task was completed, and all the drawings and papers were ready for filing, his tired mind wandered on until it brought forth this final oath.

Let us hope it relieved the strain, saved him from the asylum, and that the Forest Service will not return it for correction.

(Final miscellaneous oath) 'EXHIBIT Q'

APPLICATION FOR RIGHTS OF WAY IN THE NATIONAL FORESTS

By the

Middle Pacific Hydroelectric Power Company

STATE OF CALIFORNIA, } S.S.
COUNTY OF NEVADA }

Exhausted Smith, being duly sworn, says that he is president of the Middle Pacific Hydroelectric Power Company, and no other; that he is chief engineer of the Middle Pacific Hydroelectric Power Company, and no other; that he is both president and chief engineer of the Middle Pacific Hydroelectric Power Company, and no other; that as president and chief engineer of the Middle Pacific Hydroelectric Power Company, and no other, he has sworn to all, the all and singular, multitudinous, and multiplied, and no other, certificates, affidavits, and affirmations, respectively, in triplicate, on all and singular, maps, field notes, drawings, details, sheets, specifications, and representations, whatsoever, stated or implied, in the accompanying documents herewith, respectively, marked 'Exhibit A,' 'Exhibit B,' 'Exhibit C,' etc., including 'Z,' and no other.

AND FURTHER the affiant, as an ordinary man, sweareth yet.

IN WITNESS WHEREOF I have hereunto set my hand and the corporate seal of Middle Pacific Hydroelectric Power Company this 15th day of November 1910.

EXHAUSTED SMITH,
President and Chief Engineer,
Middle Pacific Hydroelectric Power Company.

Attest.

SUBMIT JONES, Secretary,
Middle Pacific Hydroelectric Power Company.

[SEAL]
of the Middle Pacific
Hydroelectric Power Company.

Avino Mines Company

The Editor:

Sir—In Ralph Nichols' contribution of October 21, published in your issue of November 5, he refers to the unsatisfactory results obtained from concentrating Avino ores. I believe that the trouble was due to the presence of tetrahedrite in the ore. This was the main carrier of the silver, and in the process of grinding, this mineral slimed and was carried off in the tailing. The concentration aside from this was good, all of the baser minerals being saved without any trouble. This difficulty of concentrating an ore containing tetrahedrite is well known, and has led to difficulties in other districts. I believe that at the Comet mine, at Basin, Montana, similar difficulty was encountered.

It was for this reason, at Avino, that recourse was had to lixiviation, which was carried on very successfully by Nick Flynn, who is now metallurgist for the Arizona Copper Co., at Clifton, Arizona.

J. PARKE CHANNING.

New York, November 11.

An Explanation Wanted

The Editor:

Sir—I have tried to frame a reply to 'An Explanation Wanted' but cannot do it without impugning I. A. Jackson's statements.

1. No mention is made of lime or other alkali used or required.

2. Does 'arsenical sulphide' mean sulphide of arsenic or arsenical pyrite?

3. Does the term 'lead oxide and shavings' mean lead shavings or zinc shavings?

4. Where was it ever customary to use alternate leachings of strong and weak solutions?

One would naturally conclude that the lead oxide removed sulphide from the solution, but the description of the condition of the zinc points to mercury in the solution. If there was sulphide in solution, there could not be any mercury, and *vice versa*.

A 94% extraction from $6 tailing containing 33⅓% of slime, in 96 hours by leaching, is truly an astonishing result. I pass!

CASEY WHYE.

Cyanide Problem

The Editor:

Sir—In the letter from Lee Fraser appearing in your issue of October 22 he refers to certain practice in Borneo as having been under my direction. I may have described the practice referred to, but credit for it should be ascribed to Reg. H. Parole, the general manager for the company, and to H. S. Young, in charge at Bau.

ALFRED JAMES.

New York, November 1.

Guides in some mines, notably those of the Butte district, Montana, are made of oak, instead of pine as is the case nearly everywhere else. It is claimed that the oak, being stronger and firmer than the softer woods, affords greater security in the event of the falling of a cage or skip.

Concentrates

Many of these are in reply to questions received by mail. Others are invited to ask questions and give information that [illegible]

A hand jig was described in the issue of the *Mining and Scientific Press* of November 2, 1907, a copy of which may be had by sending 25c in stamps.

Tailing and sulphide concentrate may be elevated by means of a hydraulic elevator. Sand tailing can of course be more readily lifted than sulphide, owing to difference in specific gravity of the two materials.

Power for the ordinary modern stamp mill is generally calculated on a basis of 2½ hp. per stamp. This includes rock breakers, stamps, concentrators, clear-up barrel, and any other machinery not out of the ordinary.

Mining and all other corporation stocks in California are assessable whether the company be organized on a non-assessable basis or not. Under California laws there is legally no such thing as non-assessable stock.

Tinstone (cassiterite) of remarkable purity occurs on the San Jacinto estate, in the Cajaleo mine, in Riverside county, California. This occurrence is four miles in a southeasterly direction from the city of Corona, and is the only authenticated occurrence of tin in southern California, though it may possibly exist elsewhere in that vicinity.

Hoisting-ropes are subjected to the most severe strain when the skip, bucket, or cage is stopped quickly. At such time the rope has not only to carry the dead load, but must also be strong enough to meet the momentum of the moving load. Hoisting engines should never be started or stopped quickly. A careful engineer understands this and avoids it as far as possible.

The compressive strength of timbers is seldom considered by miners. They generally select such timbers as experience has taught them will answer the purpose for the time being. They have also learned that no amount of timber can hold up a mountain when the ground begins to work. It is seldom a cave can be averted after heavy ground starts. It is then usually too late to employ additional timbers.

Substantial tracks in mines are a good investment. Heavier track in the first cost is somewhat greater, but the saving in repairs on cars, and in the loss of time in refilling overturned cars, and replacing derailed cars on the track soon compensate for the increased cost of good tracks and switches. T rail of 24 lb. is sufficiently heavy for ton cars, and if tramming be done by hand 16 lb. per yard is heavy enough.

Wulfenite occurs in many of the quartz veins of the Southwest desert regions. This mineral is lead molybdate. Probably no mineral is more frequently mistaken for gold when discovered in panning. The old-time desert prospector, to use a popular phrase, "is onto" this deceptive 'color,' and is at once able to distinguish between gold and wulfenite. A few drops of hydrochloric acid will destroy the division. The mineral fuses readily to metallic lead before the blow pipe.

Azurite is copper carbonate. It has a beautiful blue color. Linarite, a basic sulphate of lead and copper, and vivianite, a hydrous phosphate of iron, have also each a beautiful blue color. Glaucophane is a blue variety of hornblende. Frequently when azurite occurs in an ore, miners refer to it as 'bromide of silver.' No silver bromide, or chloro bromide is blue, all being of a yellowish, greenish, or greenish yellow color. The error above referred to is probably due to the occurrence of azurite with some chloride silver ores, common in Mexico.

Hydrometers are based on the general theory of the variable immersion of the instrument in liquids of different density. The Baumé hydrometer is graduated by immersion in two liquids, water and salt water containing 15% of salt of a density 1.11383 at 17.8 C. The division to which the hydrometer sinks in the salt water is marked 15. For liquids lighter than water (petroleum) the zero scale is placed near the bottom of the straight stem. It is placed at a point to which the instrument sinks in a 10% salt solution. The point to which it sinks in water is marked 10.

Lead and copper sulphide ore may be smelted together in a lead blast-furnace with proper fluxes and fuel. The lead will collect in the bottom of the crucible, while the copper unites with the sulphur to form matte which accumulates in a layer immediately on top of the molten lead, the slag occupying a higher zone. The lead passes through the siphon to the well, where it is either tapped or ladled out; the matte is drawn off through a tap-hole just above the level of the molten lead, and the slag is run out at the proper level above the matte. If the matte be very low grade it may be re-smelted or blown up in a converter to the desired grade.

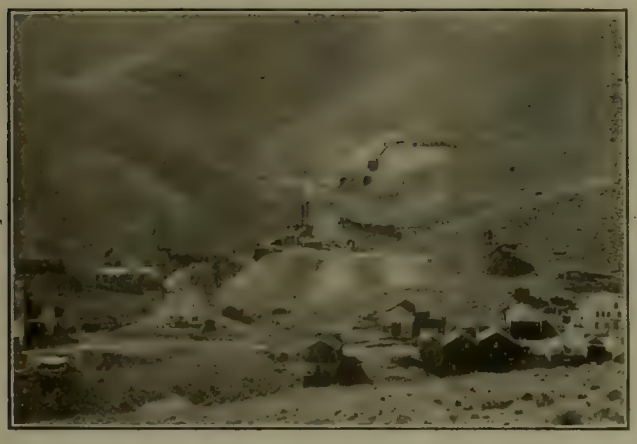
The cost of stripping the overburden from ore deposits or gravel depends upon many factors. In the case of gravel, if a stream of water under pressure is available, the overburden may be hydraulicked off at a cost of 3 or 4c. per ton. Soft rock and earth may sometimes be hydraulicked at low cost, but where the rock is firm and even moderately hard it must be blasted before removal. In case there is a large amount to be taken off, it will usually pay to run a drift into the rock with a cross-heading. This excavation is then charged with several tons of 'low powder,' the quantity depending on the amount of work done. When the blast is fired the rock is broken into pieces small enough to be removed by steam-shovels, and these are employed on large jobs, for the reason that it is the most economical. Removing rock with wheelbarrows or even hand-trammed cars is more expensive, but in small operations they are employed because the work to be done does not justify the expense of the steam-shovel installation.

Special Correspondence

SEVEN TROUGHS, NEVADA

Development and Operation of Gold-Silver Mines in Humboldt County.

Seven Troughs district is situated 30 miles northwest of Lovelock, Nevada, on the east slope of Seven Troughs mountains, and embraces an area 13 miles in length and 4 miles in width, which is drained by Stonehouse, Burnt, Wildhorse, and Seven Troughs canyons, all running easterly and opening into Sage valley. The one farthest north is Stonehouse, where the little mining settlement of Farrell is situated. Seven Troughs canyon, which is the most southerly, has been and is now the centre of the greatest mining activity. At the lower end of this canyon is the town of Mazuma, where there are two mills, of which one is in operation; a mile or farther up the canyon is the town of Seven Troughs, close to which are the Mazuma Hills and Kindergarten mines; Vernon, another small town of the district, is situated 2½ miles south of Mazuma. The mineralized belt, of the length and width above given, in which the veins occur, trends nearly north-south and consists of andesite and rhyolite, traversing which are dikes of basalt. In the vicinity of Seven Troughs are the Mazuma Hills, Reagan, and Kindergarten veins. The first two have been opened on the Mazuma Hills group on the north side of the canyon; they have nearly a north-south strike. The Kindergarten vein, opened on the Kindergarten grou which lies on the south side of the canyon, has nearly an east-west strike and a dip of 35° south. The gangue material in these veins consists of quartz, calcite, talc, and altered wall-rock.



Seven Troughs, Nevada, Showing Kindergarten Mines and Tyler Lease.

The Seven Troughs Coalition Mines Co., having six claims, including what was originally the Kindergarten, Wihuja, and Therien groups, has opened the Kindergarten vein by a 575-ft. incline shaft, 500 ft. of which follows the dip of the vein. There are five stations, from each of which a level has been driven on the vein, in opposite directions from the shaft. The vein is 3 ft. wide. A vertical shaft, situated 340 ft. southeast of the incline, was sunk some time ago; this cut the Kindergarten vein at a depth of 300 ft. Nearly equal tonnages of ore are hoisted daily from the two shafts. The development, including the shafts, cross-cuts, and drifts on the vein, aggregates close to 3000 ft. A cross-cut is being driven from the 400-ft. level to intersect the Mazuma Hills and Reagan veins, which are known to extend south into this group. The incline shaft is equipped with a steam plant, fuel oil being used. The amount of ore being mined and milled, though comparatively small, is said to run about $150 per ton. Small lots of very rich ore have been sacked and shipped. Some remarkably rich and showy specimens are obtained in this mine. The mill has 10 stamps, amalgamating plates, and concentrating tables, and a recovery of 90% is said to be made. The tailing is impounded, with the idea of treating it by cyanide later. The manager for this company is L. A. Friedman, with W. A. Ellithorpe and W. J. Thomson as mine and mill superintendents, respectively. There are 85 men on the property, including 20 men employed by three sets of lessees. The Engineer's lease, running to H. C. Zulch, W. T. P. Maeder, and J. Scarlett, is yielding a small tonnage of high-grade ore which is treated at the company's mill; the Cole lease is being operated and the output is disposed of in similar manner. The Tyler lease runs to the Lookout M. Co., for which Fred L. Tyler is manager. This takes in a block of ground 600 by 600 ft. on the Coalition company's group, higher on the hillside and southwest of the Kindergarten proper. Here a 2-compartment vertical shaft has been sunk 422 ft. It is well timbered, is in good order, and is equipped with a steel head-frame. A gasoline engine is used in hoisting. This shaft cuts the Kindergarten vein on its dip at the 422-ft. station, from which drifts run 300 ft. in ore on a vein 3 to 8 ft. wide. The hanging wall is brecciated, the foot-wall is andesite; the dip of the vein is apparently 30° south. The ore consists of quartz, talc, and wall-rock, carrying considerable sulphide of iron. One lot of 44 tons of ore taken from this level milled $26 per ton. Some ore is being stoped that is said to run $45 per ton. By driving a cross-cut from the bottom of this shaft the Mazuma Hills vein is to be tapped. Work on this cross-cut has been commenced. Mr. Tyler anticipates getting a good body of ore in the latter vein. There are two more years remaining under the terms of this lease. A force of 12 men is employed. Water for boilers and for the mill is pumped from the old Sandifer shaft in the bed of the canyon. Some is also obtained from the Tyler shaft. The Mazuma Hills and Reagan mines, belonging to the Mazuma Hills M. Co., have been idle for a year, owing to disagreement among stockholders. These properties are well developed, and are said to have good ore reserves. One of the company's assets consists of a 10-stamp mill at Mazuma. The mines were being sampled by outside people about November 1, and reports were current that they might soon be taken over by another company.

The Darby Ore Reduction Co. has a modern milling plant at Mazuma, which is being operated principally on ore taken from the Florence mine, situated half way between Seven trough and Vernon. The Florence belongs to the Seven Troughs M. Co., and is under lease to the Darby company. This mill is operated by gasoline engines and has a Scully No. 3 crusher and two 5-stamp batteries. The pulp passes from the mortars over plates, and thence to Deister tables, 2 for coarse material and 2 for slime. The sand and slime are separated by a Dorr classifier. The sand is pulverized in a tube-mill, the product of which is raised by a Frenier pump to a second series of amalgamating plates. The entire tailing of the mill, thus reduced to slime, passes to the cyanide plant, where it is subjected to cyanide treatment in agitating tanks, then filtered by the Oliver continuous method. The ore received is mined from the two veins of the Florence, gold predominating in one and silver in the other. The ore from the former contains free gold and some silver; that from the latter contains tetrahedrite, and ruby silver. The gangue consists of quartz and baryte. The concentrate runs high in silver, also in copper, derived from the tetrahedrite. This company employs 50 men at mine and mill. Matthew Gillespie is manager.

The Fresno Development Co. is having important work done in Wildhorse canyon, under direction of John McGivney. This group is a mile northeast of the Mazuma Hills, and is on what is known as the lower zone of the principal mineral belt. A 320-ft. vertical, 2-compartment shaft has been sunk. The surface equipment includes a steel headframe and a 25-hp. gasoline hoist. A level was driven

on the vein from the 40 ft station, gaining depth rapidly as it follows the vein into the body of the mountain. Another level has been run on the same vein from the 100 ft station. This work shows the vein to be 6 ft in width, one wall being andesite and the other basalt. It is known as the Wild Bull vein, the ore from which contains free gold and gold and silver in sulphide. A second vein was opened by driving a 120 ft crosscut from the 200 ft station of the same shaft. There are 14 men on the payroll. Between the Mazuma Hills and the Fresno is the Providence Extension, a group which is being developed by Morris Illinois operators, whose work is in charge of M. J. Whelan. By some surface work and shaft sinking, Mr. Whelan believes he has opened the vein of the Mazuma [illegible] and

Mill of Darby Ore Reduction Co., Mazuma, Nevada.

It is planned to sink to a depth of 500 ft. and explore from the shaft. A 25 hp. gasoline engine is to be installed. In the same locality are the Eclipse and Providence, on which a large amount of development has been done. The Mammoth group, two miles west of Farrell, belonging to Otis Johnson and others, has high grade gold ore in a quartz vein. This discovery is on the west side of the belt, close to the granite. It is estimated that there are 200 to 250 men employed at the mines, mills, and prospects of Seven Troughs district. Late reports are to the effect that the Mazuma Hills mines have been taken under a three-years lease to the Darby Gold Reduction Co., with an option on the control of the stock.

PANAMA

Annual Session of American Institute of Mining Engineers.—Interesting Lectures on Mine Fires.

Aboard ship and on the broad Atlantic is somewhat an unusual place for holding the sessions of the American Institute of Mining Engineers, but it has the advantage of not having rival attractions and assures a good attendance at the meetings. The ninety-ninth meeting of the Institute was supposed to be held in the Canal Zone from November 1 to 8, and, as announced in the circulars, the entire passenger accommodations of the Hamburg-American steamer, the *Prinz August Wilhelm*, were secured for the members attending the meeting. When the ship sailed from New York on the morning of Friday, October 21, every stateroom was taken, and even some of the officers' quarters were pressed into the passenger service. The arrangements for the trip had been made by Joseph Struthers, assisted by A. E. Vaughan, and were perfect. Their efforts were aided by a Providential dispensation in the form of magnificent weather. The party sailed from New York under cloudy skies, with heavy wraps not uncomfortable, and for the first 24 hours the sea, still slightly rough from the fag ends of the hurricane of a few days before, gave some discomfort to a few of the party whose stomachs were unacclimated. By Saturday afternoon the skies had cleared, and from then until the arrival at Colon, on Tuesday, November 1, the weather was all that could be desired, clear, but naturally growing warmer as the [illegible] were approached. The first two days were given up to getting settled and becoming acquainted. On Sunday, the third day out, services were held in the usual manner with a sermon by Dr. R. W. Raymond, secretary of the Institute. In the afternoon Dr. Raymond gave an interesting talk on Jamaica, that island being on the itinerary of the trip.

The first session of the Institute was held in the saloon at 2:30 o'clock on the afternoon of Monday, October 24. It was called to order by D. W. Brunton, president of the Institute, and was devoted to the discussion of fighting mine fires. It was entirely informal and the papers or rather talks, were not included in the list of papers announced for the meeting. The *pièce de résistance* and the first talk of the session was a description of the method adopted by the Lehigh Coal & Navigation Co. in walling off the fire at the Summit Hill mine. It was presented with blackboard illustrations, by W. A. Lathrop, president of the company, who devised and successfully carried out the stopping of the progress of this fire which had resisted all previous efforts since it started in 1859. Mr. Lathrop was followed by S. D. Warriner of Wilkesbarre, Pa., who told of extinguishing the fire in No. 8 shaft of the Calumet & Hecla copper mine at Houghton, Mich. This fire occurred in 1900 and took two months to extinguish. Other informal but interesting talks were by R. V. Norris, of Wilkesbarre, on the fire in the Big Lick slope of the Lykens Valley Coal Co., near Lykens, in 1901, which was extinguished in 1903, a strike of miners intervening and allowing the fire to gain headway; and by W. J. Richards on the final conquering of the fire in the Pine Knot colliery in the Heckscherville valley, three miles from Pottsville. This fire started in 1866 and was put out in 1905. These four men, by the way, Messrs. Lathrop, Richards, Warriner, and Norris, represent anthracite companies whose combined tonnage exceeds 50 per cent of the total production.

S. A. Taylor, of Pittsburg, told of the recent fire at the Monarch mine near Rock Springs, Wyoming, and Mr. Brunton described the walling in and smothering of the fire in the Anaconda mine at Butte. A feature of this struggle was the use of helmets that were supplied with air through rubber hose attached to the pipes that had been used to convey compressed air to the drills, and which was so successful that the miners assured the management that they could, with their use, 'put a wall around hell.' The session closed with some notes on the fire at the Leonard mine, at Butte, by Charles W. Goodale.

On Tuesday, October 25, the party arrived at Havana, and although the departure from New York was an hour behind schedule, aided by fair winds the steamer dropped anchor in the harbor of Havana at 1 o'clock, four hours ahead of time, which afforded a full afternoon for visiting the shops and viewing the city. Wednesday morning was given up to a tour of Cabaña fortress and Morro Castle, and on the return of the party to Havana at noon they were received at the palace by President Gomez, each member and lady being introduced by Mr. Struthers. The president's greeting was most cordial and all of the party were highly pleased. After the reception, carriages which were in waiting conveyed the party to the Plaza hotel for luncheon, after which they were driven about the city, visiting points of interest, and at 4:30 o'clock we were again on board, and precisely at 5 o'clock the journey to Kingston, Jamaica, was begun.

The second session of the Institute was held in the dining saloon of the steamer on Thursday afternoon, October 27, the discussion of mine fires being continued with brief talks by R. V. Norris on the fire in Luke Fidler colliery at Shamokin, Pa.; William Kelly, on four fires at the Vulcan mine at Vulcan, Mich., one of which had been caused by lightning setting fire to the shaft timbers; Edward W. Parker on the recent explosion at Palau No. 4 mine in Mexico; Gardiner F. Williams, on a fire in one of the DeBeers diamond mines in South Africa, where 202 out of 685 men were burned or smothered to death; and Hennen Jennings, on the gold mines of the Rand in which no fire had occurred.

The entire session of Friday was devoted to a talk on the production of pig iron in the electric furnace by Joseph W. Richards of Lehigh University. The subject is one to which Mr. Richards has given a large amount of study. He began with the experiments in electric smelting in France, and the manufacturer of ferro-chrome and other alloys, touched on the study in France made by Dr. E. Haanel on behalf of the Canadian Government and of his experiments in Sault Ste. Marie, and told of his own recent visit to Sweden, where, in company with the Swedish engineers, he made an exhaustive study of the progress in electric smelting of iron in that country. By blackboard illustrations, he showed the development in the construction and shape of the electric furnace, from the cubical box to one shaped like a blast-furnace, hung from heavy girders supported on the walls of the building, and with a beehive coke-oven type of arched chamber below the bosh-plates, with the electrodes placed in the arch of this chamber, and with provision for drawing the gases from the top of the stack and passing them through the bottom of the charge. By thus doing away with the use of any carbon except for combining with the oxygen in the ore, one-third of the quantity of charcoal is used. Mr. Richards is convinced that on account of the decreasing supply and higher cost of charcoal, combined with the labor conditions that obtain in Sweden, the electric furnace is to be the saving factor for the iron industry of that country. As it is now, with a furnace largely experimental in type, and which it was impossible to run to proper capacity, a saving of $1.50 per ton was effected as compared with charcoal iron. A furnace similar to the one described by Mr. Richards has recently been constructed in Shasta county, California.

During the night Jamaica was sighted, and at 6 o'clock on the morning of Saturday, October 29, the ship was docked at Kingston. Here the program as announced was carried out. An early breakfast gave opportunity for some shopping before the start was made at 10 o'clock for the drive to Castleton Garden, and the shops for a couple of hours did a 'land office' business as the men of the party outfitted themselves with duck and crash suits appropriate to the tropics, and the ladies bought linens and lacework. The ride to and from, and the short stop at Castleton Garden, was all that the program and the guide-books claim for it, as was also, on Sunday morning, the ride by special train from Kingston to Bog Walk (a corruption of 'Boca di Agua'), and the carriage ride through the canyon of Rio Cobre to Spanish Town. The return to Kingston was made at noon, and at 2 o'clock the last leg of the outward journey to the Canal Zone was begun.

The fourth session of the meeting was held on Monday afternoon and was devoted to talks on the Canal, the visit to, and the study and inspection of, which was the object of the trip. W. L. Saunders gave a review of the history of its projection from the earliest time, and then discussed the engineering and other technical problems that had been encountered and solved in the work after the construction of the Canal by the United States. One feature specially brought out by Mr. Saunders was the case of the flood-waters of the Chagres river, which is accomplished by the making of the Gatun lake. The Gatun dam, when completed, will impound a lake of water having a total area of 165 square miles, an area considerably larger than Narragansett Bay. The influence of the heaviest torrents of the Chagres river on this spread of water will be relatively insignificant. It is estimated that the utmost effect will be the raising of the level of the lake about twelve inches, and this will be slowly reduced by the overflow at the spillway. The impounding of such a spread of water would not have been possible with a sea-level canal, and the wisdom of the engineers and those in authority in determining on the lock canal is apparent. Moreover, what is not fully appreciated by many persons is that by far the larger part of the Canal is made by the building of the dam, the quantity of excavation necessary to give a deep-water channel in the body of the lake being comparatively small and easily effected.

Mr. Saunders' elucidation of the salient facts connected with the work enabled the party to get a much clearer impression of the undertaking than they could otherwise have done in the necessarily somewhat hurried inspection.

John M. Sherwood, who has visited the Zone frequently during the progress of the work, and has had excellent opportunity to become acquainted with the people, gave an interesting preachment on the social, financial, and political conditions in the Canal Zone and in the Republic of Panama. He dwelt particularly on the common error that the inhabitants are largely illiterate, whereas, among the better classes the young men and women are sent abroad to be educated, and there is to be found in the citizenship of Panama as high a degree of refinement as in any country of the globe. It naturally follows that the somewhat contemptuous behavior of many American visitors to this region and its people is resented and has not served to popularize Americans in Panama.

Some derangement of the machinery that occurred Monday night, the first untoward incident of the trip, caused a delay of three hours, and put the arrival at Colon that much behind time. For this reason the contemplated inspection of the Gatun dam fixed for Tuesday morning was abandoned for the time being, and immediately after disembarking the excursionists were taken by special train to Panama, where ample and excellent accommodations had been provided at the Tivoli hotel, situated on Ancon hill and overlooking the city and the Bay of Panama. No program was arranged for the afternoon or evening.

At 8 o'clock Wednesday morning, November 2, a special train took the party, first through the entire length of the Culebra cut, affording ample opportunity to observe the character of the material being excavated, the work of the drills, and the steam-shovels, and, most interesting of all, the perfect system of handling the trains of empty and loaded cars over a complicated network of tracks, within restricted and continually reducing limits as the channel deepens and narrows, that makes the operations at the Mahoning mine look like child's play. The dirt is certainly flying, and it is flying in a systematic intelligent manner, and on a scale that a few years ago would have been considered impossible. One is struck by the fact that the distribution of effort is so arranged that the entire length of the Canal will be completed practically at the same time. Where the heaviest work is to be done, there the greatest activity is to be observed, but other places are not neglected because the work is light. On the contrary, in the flat areas along the banks of the Chagres river where additional depth must be supplied and where the material is soft, shovels and trains are at work, but in such a way that the results will not have been destroyed by the time the other portions of the Canal are finished.

After passing through the cut the special train was hauled over a portion of the re-location for the railroad, whose old right of way will be submerged by the lake, and then returned to Panama over the regular tracks. In the afternoon the Institute party was received by President Pablo Arozamena at his official residence. President Arozamena speaks English fluently, and after the formal presentation, moved among the party in a purely informal social manner and impressed all with his genial, cordial disposition as well as with his dignity and high intelligence.

Thursday, November 3, was the Fourth of July, or Independence Day of the Republic of Panama, and everything and everybody were in fiesta, with which the showers did not interfere. No program had been previously arranged, but a special train was provided in the morning for those who desired to visit the station of Culebra and see the working models of the Pedro Miguel and Miraflores locks. The afternoon was free in order to allow those who desired to witness the festivities of Independence Day in the city. In the evening the entire party were guests of ex-President W. L. Saunders at a Spanish rendition of 'The Merry Widow' at the opera house. The music, which was particularly fine, was thoroughly enjoyed by every American of the party as well as by the native residents of the Isthmian city.

LONDON

Jicaro Gold Estates.—Tin Mines of Nigeria.

It is unusual to see new mining companies floated nowadays so that the appearance of three during the past week is notable. One of them has been formed to acquire gold mines in Nicaragua and the other two, tin gravel mines in Nigeria. The company formed to work in Nicaragua is called the Jicaro Gold Estates, Limited. The object is to acquire and develop the San Cristobal and other properties in the Jicaro gold mining district, western Nicaragua. The district is on the Jicaro river, access to which is gained through the port of Corinto on the Pacific side and the town of Leon. The chief vendor is John May, of Leon, and the property has been in charge of E. W. J. Edwards on his behalf. The report on which the property is acquired by the present company has been prepared by Mr. Edwards. The prospectus mentions that James A. Gilmour is consulting engineer to the new company, but no report is made by him. The capital of the company is £75,000, divided into 300,000 shares of 5s. each, of which 109,000 shares and £8500 in cash is purchase price divided

Map of Nicaragua.

between Mr. May and the promoting companies which introduce some subsidiary properties. The promoters have underwritten 60,000 shares at a commission of 10%, payable half in cash and half in shares. The prospectus offers 140,000 shares for subscription by the public. As regards the properties, Mr. Edwards states that the developments at San Cristobal justify a mill and cyanide plant with a capacity of 25 tons per day, and that power can be obtained from a dam on the river Jicaro. He estimates the ore to contain £5 in gold per ton and that the cost should be 16s. per ton. If all the shares are subscribed, £25,375 in cash will be available as working capital.——One of the Nigerian properties referred to above is the Bisichi Tin Co., which has been formed to acquire a tin-gravel property in Bisichi valley, northern Nigeria. H. W. Laws, mining manager for the Niger company, is the consulting engineer and has reported on this property. Trial pits on the company's property have disclosed the presence of 2,120,000 cu. yd. of gravel averaging 7¼ lb. of tin oxide per cubic yard. This means a total content on the proved area of 6800 tons of tin oxide. The river bed is estimated to contain an additional 1000 tons. Mr. Laws estimates the cost at £45 per ton, of which £15 is the actual cost of mining and sluicing. The ground tested is only one-tenth of the whole concession. The nominal capital of the company is £200,000, of which £143,000 in shares and £7000 in cash go as purchase price, and the promoters have subscribed £50,000 as working capital. Among the directors is W. S. Coutts, a partner in Adamson, Gilfillan & Co., of Singapore and Penang.

BUTTE, MONTANA

North Butte-Tuolumne and Butte-Ballaklava-Amalgamated Litigation —Clarke's Butte Interests

There seems to be no doubt that a basis of agreement has been reached between representatives of the North Butte and Tuolumne Mining companies but the nature of it is impossible to ascertain owing to an evident understanding among those who participated in the conferences leading to the settlement that the terms should remain a secret until after they have been approved by some who are heavy stockholders in both companies.——According to reports the Butte-Ballaklava company is going to make a strenuous fight in the suit brought by the Anaconda Copper Mining Co., which is now set for hearing on December 12. J. A. Percival, secretary of the company, has arrived in Butte to make preparations for the fight and has brought with him Walter Harvey Weed, who is to make an examination of the ground in dispute and will be the principal witness on behalf of the company. Mr. Weed is now examining the underground workings of the property and also the ground claimed by the Anaconda company. There are those who believe that after Mr. Weed has made his report the Butte-Ballaklava company will be willing to make a settlement with the Anaconda company, and avoid further expense. Mr. Percival, however, is still as pronounced as ever in his denunciation of the Anaconda company and declares the suit will be fought to a finish.——The interests of W. A. Clark have been so lessened in this district the past few months through the sale of his mines and reduction works to the Amalgamated Copper Co. that he no longer requires a general manager in Butte, and A. H. Wethey, who has occupied that position for many years, retires on the first day of the new year. Mr. Wethey has always had a general supervision over the street railway, the bank, the mines, and the reduction works, but now the only active business enterprises operated by Mr. Clark are the bank, the street railway, and one or two small mines. The rumor has been revived that negotiations are proceeding between the Amalgamated and Mr. Clark for the sale of the street railway, together with Columbia Gardens, which is part of the street railway system.——Six of the most prominent copper men in America made an inspection of the Washoe smelter in Anaconda a short time ago. The party consisted of L. D. Ricketts, general manager for the Greene-Cananea company; John Langdon, consulting engineer for the same company; Arthur Cole, superintendent of the smelter at Cananea; Thomas Hoatson, of Calumet, Michigan, and John C. Greenway, general manager for the Calumet & Arizona and the Superior & Pittsburg; and James Wood, superintendent for the Calumet & Arizona. After paying Butte a brief visit they went to Anaconda and spent three days looking over every portion of the big smelter. The party is on a six weeks' tour of the leading smelter cities in the country, and from here they proceeded to Utah, where they were to inspect the plants at Tooele, Bingham, and Garfield. Leaving Utah they were going into Nevada and thence to California. The trip was commenced in Mexico.——Horace V. Winchell is in Butte for the purpose of preparing the case from the expert standpoint on behalf of the Anaconda company against the Butte-Ballaklava company.——The Butte & Superior company is reported to have made $25,000 during October. The result of the bond issue is still unknown, but there is an impression that so far it has not been a success. A short time ago it was stated than an experimental shipment of 1000 tons of ore had been sent to the Clark concentrator and that on the returns received depended a deal of some kind whereby Clark would decide whether he would invest in the bond issue. There is an unofficial statement that the shipment did not come up to expectations; in fact, it is stated that the returns were not nearly as satisfactory as those received from the Basin concentrator. If the experimental shipment had turned out all right it was understood that a portion of the ore was to be treated at the Clark concentrator and Clark was to put money into the treasury of the Butte & Superior company.

DEADWOOD, SOUTH DAKOTA

The Portland M. Co.— The Mogul's Explorations. — Development at Carbonate.—Homestake Hydro-Electric Plant.—Gilt Edge and Wasp.

The purchase by the Portland Mining Co. of the mill and property of the American Eagle company, a deal which was effected at sheriff's sale, gives the Portland a splendid outlet for its ores. For the past few years the Portland has been shipping its ore to the Lundberg, Dorr & Wilson mill. Previous to that time it owned three mills. The first was a stamp-amalgamation plant, erected in 1879, long before any of the modern methods of ore reduction were known. The plant was a failure. Later the company erected a chlorination plant in Deadwood, which was a success, but was destroyed by fire. A cyanide mill at Blacktail was then purchased, and later sold to the Columbus Consolidated. The new mill will be connected with the Portland mines by an aerial tram, something less than one mile in length. The mill has an up-to-date cyanide plant, with a crushing and tank capacity of 300 tons per day. In order to work it up to this capacity, however, it will be necessary to enlarge the slime department. The plant is equipped with a Burt filter, insufficient in capacity. It will be one of several when the mill is fully equipped. The manager, H. S. Vincent, of Deadwood, expects to have the plant in operation by the first of the year. ——The Mogul company has started deep exploration on the Mark Twain, a shaft having been recently begun which will eventually be sunk to quartzite, a distance of probably 400 feet. At a depth of a little over 100 ft., lateral exploration is being conducted in the neighborhood of a porphyry sill. The company's mill, at Pluma, is operating steadily, handling a maximum tonnage.——Developments at Carbonate, by the Black Hills Corporation, R. Bunce, manager, Deadwood, are being watched with great interest. During the summer the company sampled the old dumps of the Seabury-Calkins, Iron Hill, Home Run, and other Carbonate properties upon which it has options, with the result that two cars of ore, netting over $16 per ton, were shipped. Encouraged by the showing on the dumps, two of the old shafts were unwatered. The Seabury-Calkins was found to be filled with débris, or caved, below the 100-ft. point. The Iron Hill has been drained to the 300-ft. level and a station-pump installed which will keep the mine dry to that depth. It seems the old camp is on the eve of an awakening. The company states its intention is to build a 300-ton smelter in the spring. A large percentage of the value is in silver and lead, with a little gold. During the Carbonate boom in '85 and '86, the camp had a smelter, which was run successfully, notwithstanding it was over a hundred miles, at that time, from the nearest railroad. With better railroad facilities and improved smelting methods, it seems to be only a question of ore tonnage to make a payer out of these old properties.——Tunnel No. 2 of the Homestake hydro-electric installation in Spearfish canyon has been completed and a contract let to the Westinghouse company for equipment. Between the diversion dam and the penstock of this system the tunnel work amounts to a total of 23,862 ft. Eight tunnels are included in the total, the shortest being No. 5, with a length of 1284 feet. The longest is No. 2, just completed, with 4152.3 feet. This development will produce 5000 hp. at a distance of 15 miles from the mines and mills of the company. The Westinghouse company has also been awarded the contract for a large portion of the motor equipment for the mills. One order given by the Homestake was for seventy 22-hp. back-geared motors, to be used in operating stamps, one for each ten heads. The Employee's Aid Fund, mention of which has been made in these columns, is operating most successfully, proving to be an important feature in cementing the cordial relations existing between the men and the management.

Engineers representing a group of Eastern capitalists have been busily engaged for a month past in a thorough examination of the Hidden Fortune and Columbus properties. The Hidden Fortune shaft has been unwatered and sampled and the surface showings gone over. The Columbus, too, has been given its share of attention. It is unofficially given out that the results have been encouraging, and that these properties, combined under one management, will become producers.——After a trial run of 30 days, the Gilt Edge-Maid cyanide mill has suspended operations, with a probability that nothing further will be done until spring. It is the intention of the management to erect a concentrating plant, thus saving the free gold and pyrite, and treating the residue by the cyanide process. The run just completed indicates that a considerable proportion of the value is lost when straight cyanidation is attempted, as a portion of the gold is in the free state and some of the balance in the pyrite, which is not easily amenable to the process.——The Wasp No. 2 mill is rapidly nearing completion, and will soon be in operation. Ten months have elapsed since the mill was destroyed by fire, but the new plant will have a capacity nearly a third greater than the old. All foundations are of concrete, machinery throughout is driven by electricity, there are labor-saving devices everywhere, and with its immense low-grade orebody the company is no doubt in better shape than ever before.——Frank B. Hitchings, moving spirit in the Alder Creek, adjoining the Wasp No. 2, is authority for the statement that as soon as the weather is favorable, construction will start on a big mill for that property. The Alder Creek owns an extension of the Wasp orebodies.

NEW YORK

After-Election Comment.—Opinions of Porcupine.—The Various Copper Companies.

The lull following the election has left the Eastern markets without traders, customers, or onlookers. The columns of financial comment put out in New York and Boston are filled with attempted analyses of the situation, though here and there is found franker criticism of the lack of publicity which has turned the public from Wall Street, and an occasional iconoclast who insists that financial leaders, the New York Stock Exchange, and the entire organization covered by the elastic term 'the Street,' have just such amount of public confidence as they deserve and no more. It is hardly to be conceived that a general resumption of business activity can occur, and yet no impetus be given to speculation, but at the same time it is equally certain that the exposures of the methods of high finance are now bearing full fruit in the attitude of the public. Among the houses handling mining shares, one phase most particularly commented on is the fact that, while the market interest, created by the discoveries of gold in Nevada and later the opening of the silver camp in Canada, has been steadily on the wane, for the past two and a half years, the same period has marked an unparalleled progress in the mining industry. A reawakening of public enthusiasm will come with a new generation of market followers, but no enthusiasm can be long sustained nor well deserved until there is instituted a distinct and, when necessary, pitiless policy of publicity. The old saw, "No news is bad news", is well illustrated in the present attitude of promoters and mine managers. When there is a stern "Right about, face!" on this proposition, the mining-share markets will begin to get into stride with the splendid progress of the industry.——The important event of the week locally was the publication of an extended review of Porcupine in the New York *Sun*. The *Sun* is counted the organ of J. P. Morgan and the United States Steel Corporation. Some of the important officials of the latter are said to be interested with Ambrose Monell of the International Nickel Co. in the development of the Dome property at Porcupine. Perhaps this establishes the connection between the *Sun* and the new camp, which is described in more glowing language than is usually seen, save in a prospectus or in boom advertising. The fact remains, however, that Porcupine is evidently receiving the unqualified endorsement of the prominent engineers visiting the new discoveries, and the foundation is being laid for a genuine excitement. William Frecheville, of London; Harry Howard Webb, of the Consolidated Goldfields Com-

pany of Glasgow, Scotland, all commit themselves without reserve as to the showings now apparent and as to a belief in the future of the properties. Whether the magic of a new gold discovery will galvanize the share market into life remains to be seen. A settlement of the dispute between Tuolumne and North Butte is said to have been made without a sale of the former or without any exchange of stock between the corporations. While the amicable deal is said to be made with official sanction, direct confirmation has not as yet been made nor details announced. The buying of Tuolumne has been aggressive.——The Ray Consolidated shareholders met this week in Portland, Maine, and ratified the issue of the $3,000,000 ten-year 6% gold bonds and also provided an increase in the capital stock, to permit conversion of the bonds into stock at $20 per share. The bonds are underwritten by Hayden, Stone & Co. The proceeds of the bonds are expected to provide all funds for equipping the property and to carry the company up to the point of initial production.

The Phelps Dodge company closes its fiscal year with the calendar year. Up to November, the company's production was 117,404,922 lb. of copper. Last year's output was practically 133,000,000 lb. Considering the adverse conditions in the copper metal market, the Phelps Dodge company has been a remarkable dividend earner, paying 15½% last year, and will undoubtedly show an equal net this year.——A settlement of the Butte-Ballaklava-Anaconda litigation was rumored, probably by reason of the compromise of the difficulties between the Tuolumne and the North Butte. Official denial of such agreement is made by wire from the Butte-Ballaklava officials. An examination of the disputed territory and the orebodies claimed by the Anaconda is to be made by Walter Harvey Weed.

The Boston Miami and the Live Oak, in the Globe, Arizona, camp, have made an agreement to do joint churn drill work along their boundary line.——Development work at the Live Oak property, near Globe, south of the Inspiration and Keystone groups, was begun in December, 1908, and up to July 1, 1910, more than 4000 ft. of underground workings were driven. One drill was placed in operation in the spring of 1910. On July 1 of this year, according to the company's report to stockholders, the ore reserves were estimated at 7,200,000 tons, assaying 2% copper. Development has been carried on during the past summer by means of three drills, and it is stated that the reserves have now been increased to 10,000,000 tons assaying 2% copper.——The Boston Miami was recently taken over by the Arizona Cananea Mines Corporation, which controls a large property at Cananea.——The new bond issue of the American Smelters Securities Co. of $15,000,000 is underwritten by Kuhn, Loeb & Co. The underwriting syndicate was largely oversubscribed. The deal between Kuhn, Loeb & Co. and the Guggenheims was said to have been arranged without consulting the house of J. P. Morgan & Co., a step which was a great surprise to the Street. The bonds are to be offered to the shareholders at par, and are convertible into common stock of the American Smelting & Refining Co. when the bonds sell at par. Proceeds are to be used to liquidate the floating indebtedness of about $11,000,000 of the Securities company and to complete the payment for the Baltimore plant bought in 1907.——The directors of the Calumet & Arizona Copper Co. and the Superior & Pittsburgh Copper Co. are to hold a joint meeting in Duluth next week in an attempt to come together on a plan for consolidation. The smelter of the former company needs additional tonnage, while a merger will save the Superior & Pittsburgh smelter charges, or the necessity of building its own smelter plant.——The troubles of F. Augustus Heinze and the companies which he dominates seem to be perennial. Immediately following the announcement that the Ohio Copper bonds had been successfully placed by the French bankers, comes a sale at auction of 40,000 shares of Ohio Copper at $1.25 per share, 28,128 shares of United Copper common at $4.87 per share, and 18,700 shares of Davis Daly at 82c. per share, the second installment of 50c. being unpaid. It is the understanding in the Street that this is the loan of the Mercantile National to Heinze and that it has been hanging over the market ever since the 1907 panic.——The Pacific Coast Mining Co. with properties on the Mojave Desert near Ludlow, California, has been reorganized. The Pacific Coast is offered and controlled by officials of the New York Central railroad. Among the prominent shareholders are Chauncey M. Depew, of New York, and B. B. Chase, of Rochester. The new organization is the Pacific Mines Corporation, with a capital of $1,000,000. John Hays Hammond is to act as president. The shares of the new company are fully subscribed, and there is to be no participation by the public.——The Rio Plata Mining Co., operating in Chihuahua, Mexico, producing about 85,000 oz. silver monthly, has secured a license in Mexico, and the Mexican subsidiary company, the Compania Minera Rio Plata, is to go out of existence.

GOLDFIELD, NEVADA

Red Top Extension Development. — Goldfield Annex Lease. — Lower Levels of Goldfield Con.—The Florence.

Production of shipping ore has begun at two separate points in the Goldfield district within the past week and ore of excellent grade is being sent to the samplers, while there is good promise that the shipments will be continued. The more important developments appear to have been made on the Red Top Extension, a small fractional claim situated between the Clermont and Miss Jessie claims of the Consolidated Mines Co., and between the end lines of these claims. Apparently the new find is in a part of the Clermont or Red Top veins. The ore was exposed in a raise, 60 ft. above the 500 ft. level, and 100 ft. southwest of the shaft which had been sunk by lessees to a depth of over 600 ft. The lessees worked this ground about two years ago, but found no ore of commercial grade, and the work was stopped. It was resumed, however, under a lease that was partly financed by some of the owners of the ground. The lessees say they have exposed in the raise an ore-shoot 3½ ft. wide, the ore in which averages $40 per ton. The other new producer is the Goldfield Annex lease, on the Polverde claim of the Jumbo Extension, the shaft of which is close to the Clermont. This lease produced some ore last year, but the ore-shoot which was lost on the 800-ft. level was later recovered. Ore shipments are now being sent to the sampler. The Grizzly Bear workings at a depth of 1170 ft. are on a vein of low-grade ore. This lease has a two-compartment shaft 1200 ft. deep, the deepest in the district, and has done considerable development.——According to reliable information, a constant improvement is apparent on lower levels of the Consolidated mines. The orebody exposed a short time ago on the 1000-ft. level of the Clermont has maintained its high average value and volume and contains ore of the grade that the company has been shipping to smelters. The October shipments of smelting ore averaged $840 per ton; and the average of all ore taken from new work on the 1000-ft. level was 3.28 oz. per ton. The stopes on the 750-ft. level of the Clermont continue to yield rich ore, and there still remains a large tonnage of similar ore in the Mohawk mine.——The results of new work on the Combination have been gratifying and it is believed the orebody exposed lies parallel to the vein developed in the Hampton stope. Seams of high-grade ore, in which free gold is visible, have been mined on the fourth and fifth levels almost to the boundary line of the Florence. It is said that the ground for a width of from 100 to 150 ft., between the Combination shaft and the old January workings, has ore that can be profitably treated. New development has progressed at the usual rate during the fiscal year ended with October.----The Florence Goldfield company maintains a daily production and mill treatment of 150 tons. Shaft sinking continues and a station will soon be cut at 600 ft. depth. The purpose is to sink to 1000 ft. Exploration work from the 600-ft. station is to be carried out. The Florence is said to be making a satisfactory profit from the treatment of comparatively low-grade ore. Combination Fraction is treating 50 tons per day at its leased 20-stamp mill.

General Mining News

ALASKA

ARIZONA

CALIFORNIA

is said to be [illegible] manager with Nicholas Frecker [illegible] work.

KERN COUNTY

The oil production of California for [illegible] as follows: Kern River [illegible] Midway [illegible] Salt Lake-Sherman [illegible] Whittier-Coyote [illegible] Ventura [illegible] Summerland [illegible] [illegible] from the production of the [illegible] The October consumption was about [illegible]

C. J. Teagle of Johannesburg has given [illegible] sale of his placer property situated at [illegible] Cunningham has assigned the deposits [illegible] the bond. The property was worked [illegible] days and is said to contain a good [illegible] gravel that will pay to handle. A plant [illegible] for this purpose. It is close to Teagle station on the Southern Pacific.

NEVADA COUNTY

(Special Correspondence.) The North Star Mines Co. has commenced the building of a road-bed for an electric car line from the Central shaft to the Massachusetts Hill mine. A suspension aerial railway is proposed to carry over the work. Four cables are strung across a ravine and are fastened to the cables, and rails spiked to them. The ravine is filled by means of cars of broken waste quartz which discharge from the suspended railway. It is reported that developments at the Massachusetts Hill will commence early next year. The company is pushing development vigorously at the Cincinnati Flat group with pleasing results. A pipeline is being laid to the property from the North Star compressor house, and a water main is also under construction. At the Central shaft a new hoist is being installed. Developments at the Empire progress steadily with the 40-stamp mill running. The new cyanide annex is nearing completion. All the tanks are in position and the machinery is being installed. The approximate cost is $50,000. The ore-shoot recently opened in the Cassidy Con. continues to show high-grade milling quartz. The Pennsylvania is temporarily idle because of lack of water, but is expected to resume soon. The W. Y. O. D., owned by the Pennsylvania company, is working steadily, Bennet Ople is superintendent. The Golden Gate Co. is installing a 55-hp. electric hoist, and contemplates sinking the shaft to a depth of [illegible] ft. Mr. Martin, the superintendent, reports an 8-ft. vein at the bottom of the 600-ft. shaft. San Francisco people are interested. — It is expected that the unwatering of the Prudential mine will be accomplished before the end of the week. —Fire caused damage of $8000 to [illegible] at the hoist of the Pittsburg mine last Friday. The structure was destroyed, but the plant was not seriously injured. A shoot of bonanza ore has been opened in the lower adit of the Red Ledge mine, near Washington. Its extent is as yet undetermined. —The Grover Murphy mine has been purchased by the Honolulu M. Co. for $20,000. Harry B. Gray is superintendent.

Grass Valley, November 21.

SAN BERNARDINO COUNTY

The Bagdad-Chase mine, and the adjoining Roosevelt group, situated seven miles from Ludlow, have been sold to the Pacific Mines Corporation of New York, the deal was arranged by Frank A. Keith of Los Angeles.

SIERRA COUNTY

The Red Star mine, at Alleghany, has a body of rich ore which is believed to be the northern extension of the Tightner lode. The find was made by driving a cross-cut from the Eureka to the Red Star. It is said the entire face of the cross-cut is in ore of good grade. L. P. Woodbury is manager.

TUOLUMNE COUNTY

(Special Correspondence.)—Ore of extraordinary rich [illegible] was encountered at the [illegible] Mine, [illegible] Pioneer on the [illegible] [illegible] [illegible]

General Mining News

ALASKA

(Special Correspondence.)—On Prince of Wales Island another 1400-ton shipment of sulphide ore from the It mine is being transported by barge to the Tyee smelter. A diamond-drill is being used with good success in prospecting the ground ahead of main workings.——The Dean prospect, about a half mile west of the It, is being developed by the Pacific Metals Co.; 3000 tons of ore that will net $10 per ton is now reported in sight. The third payment has been made to the original owners of this property.

Ketchikan, November 20.

Georgetown, situated on the Kuskokwim river, 350 miles upstream from Bethel, is now recognized as the principal trading point in that district. Provisions are reported plentiful for the winter in Kuskokwim camps. Julien creek, a short stream that flows into Yukwonilnuk river, is reported as having good pay-gravel. The latter is a tributary of the Kuskokwim. The great flats of the Yukwonilnuk contain some gold at bedrock.

The report of the Alaska United Gold M. Co. for the month ended October 15, 1910, is as follows: Ready Bullion mill, 120 stamps, ran 28 days, 18 hr., 12 min.; water power, 26 days, 1 hr., 57 min.; steam power, 2 days, 16 hr., 15 min. Ore crushed, 18,890 tons; concentrate saved, 321 tons. Estimated gross value of free gold, $24,139.67; base bullion, $1577.89; estimated gross value of concentrate, $15,807.98; total, $41,525.54. Realizable value, $39,357.15. Operating expenses, $27,868.75; net operating profit, $11,488.38; construction expense, $4551.67. Yield per ton of ore milled, $2.198.

The 700 Claim mill, 100 stamps, ran 29 days, 16 hr., 43½ min.; water power, 18 days, 13 hr., 55½ min.; steam power, 11 days, 2 hr., 48 min. Ore crushed, 16,197 tons; concentrate saved, 327 tons; estimated gross value of free gold, $21,215.54; concentrate, $17,499.16; total, $38,712.70. Realizable value, $36,536.35. Operating expenses, $24,297.89; net operating profit, $12,238.46; construction expense, $2749.63; yield per ton of ore milled, $2.39. Development work on Ready Bullion, in ore, 318 ft.; assay value, $1.06 to $2.46; development on 700 Claim, 146 ft in ore, assays $4.78 to $4.94. Stock of ore broken: Ready Bullion, 678 tons; 700 Claim, 14,767 tons.

The report of the Alaska Mexican Gold Mining Co. for the month ended October 15 is as follows: Mill time, 30 days. The 120-stamp mill ran 29 days, 15 hr., 57 min. Water power, 13 days, 14 hr., 33 min.; steam power, 16 days, 1 hr., 24 min. Ore crushed, 18,516 tons. Concentrate saved, 350 tons. Estimated gross value free gold, $33,643.13; base bullion, $474.01; estimated gross value of concentrate, $32,711.78. Total, $66,828.92. Less amount due Alaska United Co., $1765.76; net, $65,063.16. Total realizable value, $62,746.80. Operating expense, $27,472.80; net operating profit, $35,273.93. Construction expense, $7103.02. Yield per ton of ore milled, $3.51. Stock of broken ore, 7821 tons. Development, 216 ft. in ore, 233 ft. in waste. Assay value, $2.98 to $4.58.

The report of the Alaska Treadwell Gold Mining Co. for the month ended October 15 is as follows: Mill time, 30 days. The 240-stamp mill ran 29 days, 5 hr., 38 min. Water power, 26 days, 4 hr., 42 min; steam power, 3 days, 56 min. Ore crushed, 33,740 tons; concentrate saved, 580 tons. The 300-stamp mill, water power, ran 29 days, 14 hr., 50 min. Ore crushed, 49,224 tons; concentrate saved, 860 tons. Total concentrate, 1440 tons. Estimated gross value of free gold, $104,940.51; base bullion, $1570.12; estimated gross value of concentrate, $73,650.75. Total, $180,161.38; total realizable value, $170,471.98. Operating expenses, $93,443.60; net operating profit, $77,028.38. Construction expense, $18,827.84. Yield per ton of ore milled, $2.17; stock of broken ore, 6904 tons. Development, 247 ft. in ore, 287 ft. in waste; assay value, $3.23 to $18.07.

ARIZONA

GILA COUNTY

(Special Correspondence.)—Nearly all the machinery is in place at the concentrating plant of the Miami Copper Co. Production at the rate of 1000 tons a day will be commenced January 1, 1911. The total amount of underground work is 76,069 ft., including the several shafts. Last week 302 ft. of driving and raising were done on and above the 370 and 420-ft. levels. The power plant and concentrate bins are practically complete. The latter have a capacity of 1500 tons. The company is employing about 600 men. B. Britton Gottsberger is general manager.——T. W. Hamilton, manager for the Summit Mining Co., is visiting the property, situated 10 miles west of Miami. He is much pleased with the results of developments since the purchase of the property a few months ago. In the course of developing much ore of high copper content has been discovered. Apparently, there is enough ore in sight today to return to the owners the full amount paid for the property. Some of the ore exposed runs from 28 to 31% copper.——It is probable that during the stay of T. W. Hamilton some definite policy concerning future work at the Cactus mine will be outlined.——The Arizona Commercial Copper Co. is sinking its seventh diamond-drill hole at a location west of the Eureka shaft. The first six holes, two of which found ore averaging between 5 and 6% copper at a depth of 900 ft., were east of the Eureka shaft. The pumps are raising approximately 1600 gallons of water per minute.——The drift on the eighth level of the Superior & Boston mine gives promise of finding a body of oxidized ore when the Great Eastern vein is struck. The foot-wall rock is copper stained.——The Arizona-Colorado Copper Co. has two machine-drills working in a stope on the eighth level where the average copper content is about 4%. John F. Shaw is manager.

YAVAPAI COUNTY

The Jerome Verde Co., the Haynes Copper Co., and Arkansas & Arizona are carrying on development work on their respective properties in the Black Hills district, east of Jerome. The first named is sinking a shaft and pumping water, the second is driving on a 6-ft. gold-bearing vein, while the last is at present sinking below the 600-ft. station.

YUMA COUNTY

Ore is being shipped by the Wardwell-Osborne Copper Mines Co. to the smelting plant at Humboldt. It is reported that the first carload shipped netted $500. Three more cars are to be shipped this month. Development expenses are being paid out of the proceeds of ore sold. Parker is the shipping point.——John Sanborn, who has partly developed a mine in Riverside mountain, is preparing to ship 1000 tons of ore to the Humboldt smelter. This ore is on the dump; the mine is 8 miles from Calzona station. The freight rate to Humboldt is $2.50 per ton on ore running from $15 to $25.——The mill of the Desert Mines Co., in the vicinity of Vicksburg, was to begin operating November 15. B. J. Hall, identified with the company, states that mining and milling costs will be about $4.50 per ton of ore.——A rich vein of free-gold ore is said to have been discovered on the property of the Golden State M. Co. at Whipple Wash, near Parker. Some of the ore was sacked and shipped.

CALIFORNIA

CALAVERAS COUNTY

The Calaveras Copper Co., whose large holdings are at Copperopolis, has extensive development from a number of shafts, the deepest of which is 800 ft. These shafts are aligned along the strike of the principal vein, the ore from which carries chalcopyrite that is said to sample 4% copper. It contains neither gold nor silver. The property has much new equipment, including an oil-burning reverberatory smelting furnace, a 125-ton blast-furnace, McDougall roasters, two stands of converters, and a concentrating plant. All machinery is to be electrically operated. A large tonnage of ore is broken in the stopes, and there

is said to be 120,000 tons on the surface. J. H. Dyer and L. manager, with Nicholas Treloar in charge of the mine work.

KERN COUNTY

The oil production of California for October, 1910, was as follows: Kern River, 1,064,000 bbl; Coalinga, 155,400; Midway, 929,100; Sunset, 521,400; McKittrick, 470,400; Salt Lake-Sherman, 275,400; Los Angeles City, 54,000; Whittier-Coyote, 93,200; Fullerton-Brea Canyon, 600,000; Ventura, 44,700; Newhall, 10,350; Santa Maria, 72,000; Summerland, 4,000. Total, 6,046,976 bbl, a decrease of 687,169 bbl from the production of the previous month. The October consumption was about 5,200,000 barrels.

C. J. Teagle, of Johannesburg, has given a bond for the sale of his placer property situated at Summit. H. E. Cunningham has sampled the deposits for those taking the bond. The property was worked profitably in early days, and is said to contain a good yardage of unworked gravel that will pay to handle. A plant is to be installed for this purpose. It is close to Teagle station on the Southern Pacific.

NEVADA COUNTY

(Special Correspondence.) The North Star Mines Co. has commenced the building of a road bed for an electric car line from the Central shaft to the Massachusetts Hill mine. A suspension aerial railway is employed to carry on the work. Four cables are strung across a ravine, ties are fastened to the cables, and rails spiked to the ties. The ravine is filled by means of cars of broken waste quartz, which discharge from the suspended railway. It is reported that developments at the Massachusetts Hill will commence early next year. The company is pushing development vigorously at the Cincinnati Flat group with pleasing results. A pipe-line is being laid to the property from the North Star compressor house, and a water main is also under construction. At the Central shaft a new hoist is being installed.——Developments at the Empire progress steadily with the 40-stamp mill running. The new cyanide annex is nearing completion. All the tanks are in position and the machinery is being installed. The approximate cost is $50,000.——The ore-shoot recently opened in the Cassidy Con. continues to show high-grade milling quartz.——The Pennsylvania is temporarily idle because of lack of water, but is expected to resume soon. The W. Y. O. D., owned by the Pennsylvania company, is working steadily; Bennet Opie is superintendent.——The Golden Gate Co. is installing a 55-hp. electric hoist, and contemplates sinking the shaft to a depth of 1000 ft. Mr. Martin, the superintendent, reports an 8-ft. vein at the bottom of the 600-ft. shaft. San Francisco people are interested.——It is expected that the unwatering of the Prudential mine will be accomplished before the end of the week.——Fire caused damage of $8000 to $10,000 at the hoist of the Pittsburg mine last Friday. The structure was destroyed, but the plant was not seriously injured.——A shoot of bonanza ore has been opened in the lower adit of the Red Ledge mine, near Washington. Its extent is as yet undetermined.——The Grover-Murphy mine has been purchased by the Honolulu M. Co. for $20,000. Harry B. Gray is superintendent.

Grass Valley, November 21.

SAN BERNARDINO COUNTY

The Bagdad-Chase mine, and the adjoining Roosevelt group, situated seven miles from Ludlow, have been sold to the Pacific Mines Corporation of New York; the deal was arranged by Frank A. Keith of Los Angeles.

SIERRA COUNTY

The Red Star mine, at Alleghany, has a body of rich ore which is believed to be the northern extension of the Tightner lode. The find was made by driving a cross-cut from the Eureka to the Red Star. It is said the entire face of the cross-cut is in ore of good grade. L. P. Woodbury is manager.

TUOLUMNE COUNTY

(Special Correspondence.)—Ore of extraordinary richness has been encountered in the Pavan Co.'s mine, which adjoins the Beaver on the north. The vein, 2 to 3 feet wide, is filled with gold-ore pockets, one piece weighing 200 oz. and valued at more than $2000. It is the belief that the ore-body is one of the best ever discovered in that district. The property was bonded to an Eastern company only a few weeks ago, and until then was worked by the owners, McCormick, Robert & Friell, who installed a 4-stamp mill just prior to the change. Development is progressing steadily.——The Climax mine recently bonded to E. Sergerstrom and others, is showing excellent prospects, much of the ore now being extracted in development being of high grade.——It is reported that the shaft at the Yorktown mine will be sunk to 500 ft., also that cross-cutting and much driving will be done.——It is said development work is to be resumed at the Toledo mine, northwest of the Rawhide, and owned by R. P. Clement, of San Francisco. As nothing has been done for six years the shaft, 580 ft. deep, must first be retimbered.

Tuolumne, November 21.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.) A body of mixed ore and quartz, exposed in the heading of the Homestake adit on Lincoln mountain, is 27 ft. wide. Samples taken across the streak assayed 0.83 oz. gold per ton.——The deal for the transfer of the Santiago mine in East Argentine probably will be closed in a few days. The consideration is to be $500,000, with a cash payment of $100,000. The North American S. & M. Co., the purchaser, will commence development.——The Vidler adit, which is being driven under the Continental Divide, is advancing at the rate of 7 ft. per day. In another vein recently encountered, a streak of galena was opened that is from 6 to 8 ft. wide. Tests show 90 oz. silver to the ton and 45% in lead.—Two feet of ore has been encountered in the raise from the 240 ft. level of the Astor mine on Democrat mountain, assays of which showed 80 to 2000 oz. silver to the ton. This is considered the best discovery that has been made in upper Clear Creek district in the last six years.——The East Griffith mine, on Griffith mountain, is to be operated by lessees. J. N. Stewart and associates have taken a block of ground 300 by 300 ft. and have started stoping on an 8 to 12-in. streak of ore that assays 117 oz. silver and 0.50 oz. gold to the ton. The Griffith M. Co. contemplates sinking the shaft to a depth of 700 ft.——White & Co., lessees on the Gold Dirt, have commenced shipping smelting ore, the average of which is $55 per ton.——Louis Rebo, leasing on the Revenue mine up Geneva gulch, is shipping ore that mills 500 oz. silver to the ton.——Work on the Paragon adit has been resumed. The plan is to extend it so as to intersect the Ruler vein 160 ft. ahead.

Georgetown, November 19.

GILPIN COUNTY

(Special Correspondence.)—The Topeka mine in Russell gulch has become one of the heaviest shippers of the county. A force of men is now employed on the twelfth and thirteenth levels, and shipments of smelting ore are being made.——P. Sweeney, owning a group of claims up Fall river, has uncovered a foot of ore that will mill 2 oz. gold to the ton. The streak has been opened a length of 30 ft.——John Bosper, leasing on the seventh level of the Topeka mine, has an 18-in. streak of pyrite that mills 3.50 oz. gold to the ton. Lewis & Myers, at work on the same level, are stoping a body of mill ore 3 ft. wide that runs $14 to the ton in gold.——Shipments will be started soon from the Golden Slipper property on North Boulder creek. A streak of ore 22 in. wide has been opened that assays from $16 to $20 to the ton in gold.——A force of 80 men is employed on the Adduddel mine and shipments of concentrating and smelting ore are being made regularly.

Central City, November 19.

The ninth level of the Freedom mine, on Winnebago hill, is being put in order so that an examination may be made.

Sinking is to be resumed as soon as the sump is pumped out.——Lessees on the Baker mine, on Quartz hill, are mining on the 200-ft. level, taking ore from a shoot 150 ft. long, having 200 ft. of stoping ground. The vein is 4 ft. wide; the ore mills $40 gold per ton by amalgamation. Selected smelting ore in small lots runs $120 per ton.—— The Gilpin-Eureka M. Co. has opened a 12-ft. vein of ore running $10 per ton on its 600-ft. level. The same vein on the 500-ft. level was 4 ft. wide, and this included a small streak of smelting ore which sampled $60 per ton.

LAKE COUNTY

The property of the Clear Grit M. Co., at Leadville, is being developed under direction of C. J. Moore. The shaft was sunk 185 ft. and at this depth a station was cut and a pump installed. Driving from this station in the porphyry is in progress, the plan being to open an ore-shoot on its rise.——Ed. Brady and Thomas Flannery, having a lease on the Dunkin on Fryer hill, have made small shipments of ore at regular intervals in the last six months. Recent development resulted in opening a streak of ore running high in silver with lead carbonate.——It is reported that a 60-ft. vein carrying lead sulphide, accompanied by argentite, was discovered in the course of development from the Yak tunnel.——Kirke White and Howard E. Burton of Leadville have taken a lease on the Reindeer, on Rock hill, and expect to install some new equipment. Zinc carbonate found on the dump assayed 37% zinc. The body of ore which they hope to reach was opened by the Stevens shaft on an adjoining property.——The Hayden shaft, on Fryer hill, is producing 60 tons per day of zinc carbonate.

SUMMIT COUNTY

The Hamilton mine, near Breckenridge, is active again after an idleness of several years. Charles Andrew and Bert Acton have taken the contract to drive two cross-cuts for the purpose of opening two veins.

TELLER COUNTY

The Roosevelt drainage tunnel in Cripple Creek district has been completed, the cost having been approximately $600,000. It drains the mines of the district to a depth of 730 ft. below natural water-level. T. R. Countryman, engineer in charge of the work, estimated the volume of water in the basin to be drained at 50,000,000 gal. per vertical foot, with the constant addition of 1000 gal. per minute. The unwatering of this basin, according to an estimate, will make available a tonnage of ore valued at $192,500,000. The lowering of the general water-level, as the result of the drainage, is stated to be at the rate of 10 ft. per month. The length of the tunnel is about three miles; the rock passed through was mostly granite, and, except at the portal, no timbering was required. Most of the work was performed under contract by A. E. Carlton. The funds required to meet the expenses of the work were subscribed by 20 mining companies whose properties are to be drained by the tunnel.

IDAHO

IDAHO COUNTY

The American Eagle mill at Elk City turned out gold bullion worth $4200, and 10 tons of concentrate worth $900, as the result of 15 days' run. The ore from which these products came was taken from a shoot opened on the third level of the American Eagle mine. The property is being operated by A. W. Boyd as lessee.

SHOSHONE COUNTY

A carload of tungsten ore was recently shipped from the Golden Winnie mine at Murray. This is an old mine which has also produced gold ore. It has a small mill in operation.

MICHIGAN

The ores from the Osceola mine, near Houghton, yielded an average of 17.1 lb. of copper per ton for 1908; 16.9 lb. for 1909, and for 1910 it is announced that the average recovery may be still lower. For the first ten months of this year, the mine produced 15,981,430 lb. of copper, as against 21,535,238 lb. for the first ten months of 1909. The cost of production for 1909 was 9.47 cents per lb., and a slight advance in cost is anticipated for 1910.

MONTANA

LINCOLN COUNTY

The Snowshoe mine, one of the principal properties in Libby district, has had its pumps in operation the past month and a small force of men has been employed. These facts indicate that the mine, which has been inactive for four years, is to resume operations. It is a silver-lead property and is opened by a 400-ft. shaft. Production in former years was profitable, the mineral having been marketed in the form of concentrate. The Snowshoe is situated twenty miles from Libby, but it can now be served by the Dawson Lumber Co.'s railroad, which extends almost to the mine.——The Shaugnnessy Hill mine shipped a car of silver-lead ore to East Helena, and has two more cars ready for shipment. A railroad spur may be built to the mine. The operators are A. J. McCorkle and T. H. Town.

NEVADA

LINCOLN COUNTY

The Nevada-Utah Mines & Smelters Co., with Ernest R. Wooley as manager, and H. C. Parker as superintendent, has acquired the Raymond & Ely and other mines in Pioche district, and has commenced work. The Raymond & Ely No. 5 shaft is to be put in order and mining operations are to begin at the Day mine. It is predicted that this organization may acquire other important mines of the district.

NYE COUNTY

(Special Correspondence.)—Sinking the Belmont shaft from the 1100-ft. level is progressing, while development on the various levels is under way. The Belmont vein is being followed on its dip from the 1166-ft. level. As soon as the new surface plant has been completed the company will prospect other veins on its property.——No. 2 shaft of the West End is 80 ft. below the 400-ft. level, and as soon as the 500-ft. point is reached a station will be cut and a new level opened. The main workings are centred by way of the 275 and 400-ft. levels, where large bodies of ore have been proved. All ore shipments are made from these levels. On the south side of the property, along the MacNamara line, a 4-ft. vein of fair-grade ore has been opened.——The Montana mill is crushing approximately 1052 tons of ore per week, maintaining an extraction of 92.6%. Stoping on the Triangle and Martha vein systems is in progress.—— Developments on the 800-ft. level of MacNamara are in progress, several raises being made on the foot-wall of the thick quartz lode in order to cross-cut the vein at those points. Ore shipments amount to about 200 tons per week. ——Thirty stamps are dropping at the Tonopah Extension, crushing 135 tons per day, the extraction being 92%. It is stated that profits average about $15,000 per month.——The Manhattan Mining & Leasing Co. is sinking in shaft 14 on Union No. 9 claim. New machinery has been installed and four shifts are employed.——The 5-stamp mill at the Buffalo is nearly completed.——The War Eagle mill is running steadily on ore from the Dexter group. About 40 tons is treated daily.

Tonopah, November 19.

The 10-stamp mill of the Nevada Reduction Co., at Manhattan, is operating on ore from the Swander lease. The crushed ore passes over plates, then to a Dorr classifier, the sand from the latter being pulverized in a tube-mill; the slime from the Dorr machine joins the tube-mill slime, and this stuff passes over secondary plates, thence to Pachuca agitating-tanks for cyanidation, and finally to Oliver filters. Precipitation in zinc-boxes follows. C. L. Logue is in charge of the mill.——The Rawhide Coalition and Rawhide Queen mines, in Rawhide camp, have produced $385,000, according to mill and sampler returns. The Queen owns a mill which treats ore from both mines. It is claimed both properties are out of debt and have funds in their treasuries.

ORMSBY COUNTY

The Athens, the only patented claim in the county of Ormsby is being worked under lease after having been idle since 1874. A stringer of high-grade ore was recently encountered and some ore has been sacked for shipment.——The Eagle Valley M. & M. Co. with offices at McGill has four claims adjoining the Athens on which development has been in progress for the past six months. An adit has been driven 300 ft. and a 60-ft. winze sunk. While enlarging a station for the installation of a hoist a 6-ft. face of gold-bearing quartz was encountered which pans freely. A cross-cut is being run from the winze to cut the vein.

McGill, November 21.

STOREY COUNTY

The milling plant of the Charles Butters Co., in Six Mile canyon, Virginia City district, is to be closed down for the winter. On this account ore shipments from the Mexican, Chollar, and Potosi have been discontinued. Ore to be counted on was not deemed sufficient to keep the plant in operation steadily through the winter. During the closed-down period the mill is to be put in first-class condition, with the plan of resuming operations next spring.

Butters Cyanide Plant, Six Mile Canyon.

WHITE PINE COUNTY

The Nevada Lead Metals Exploration Co. has leased its San Toy group at Hamilton. This was formely known as the Silver Plate mine, which produced well in early days. Hamilton camp has a large tonnage of silver-lead ore that could be profitably shipped if it had a railroad connecting with outside points.

It is announced at Ely that the Giroux Con. Mines Co. has definitely decided to erect a smelting plant for the treatment of its ore. The mine is at Kimberly, seven miles from Ely.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence.)—The mill of the Ernestine Mining Co. crushed 643 tons of ore in 7 days, from which was produced 46 sacks of high-grade concentrate. Precipitate smelted yielded 6123.60 troy ounces of gold and silver bullion. Headings were advanced 96 ft. during the week, the eleventh level west continuing in rich ore.——Officials of the Socorro mines visited the property on the 13th. Development in the lowest levels continues in high-grade milling ore.——At the Deadwood mine a pipe-line is being laid and cross-cuts are being driven both ways from the 500-ft. station in the shaft. The new vein recently discovered on the foot-wall side is to be opened, and the Last Chance and Queen lodes are to be opened on the hanging-wall side.——The Perseverance shaft of the Enterprise Mining Co. has been re-timbered and the mine will be sampled in the lower workings.——The mill of the Treasure Mining & Reduction Co. [illegible] on the 7th. The hoist, electric power plant [illegible] satisfactorily.——Mines, quarters and other buildings are being constructed at the Gold Dust mines.——A vein of good ore is being developed on the 200-ft. level of the Trilby.

Magdalena, November 19.

OREGON

BAKER COUNTY

The Eastern Oregon Mining Congress, which met at Sumpter, October 20 and 21, was well attended by mining men of that part of the State. Papers were read and matters of interest were discussed.——The Mormon Boy mine at Cable Cove, has been taken over by S. C. Love; work has been resumed with Richard Addoms in charge. In the 4-ft. vein there is said to be one to two feet of profitable sulphide ore.——The Highland mine, situated close to the North Pole mine, in Cracker Creek district, shipped 55 tons of ore since September 1, which sampled $41.50 per ton, the net returns amounting to $17,247.50.

GRANT COUNTY

The mine and mill of the Cougar M. & M. Co. have been sold to E. D. Sanders, of Spokane, and his Eastern associates. The property is situated in the Blue mountains, four miles west of Granite. The mine is well developed, and a considerable tonnage of mill ore is said to be accessible. It is announced that the mill capacity is to be increased.——The Dixie Meadows mine, near Prairie City, has been sold to the Dixie Meadows M. Co., made up largely of Eastern people; the price was $75,000, paid in cash. The plans contemplate further development this winter and the building of a new mill later. L. A. Greenley is to be in charge.

JOSEPHINE COUNTY

In Galice district the Golden Wedge mine is to resume operation as soon as water for power is provided.——Hydraulic work is to begin on the Old Channel mine with the commencement of the rainy season.——The dredge on the Jewell & Lewis property is ready to begin work.——The mining people of Galice are making a determined effort to have the National Forest boundaries so changed as to place that mining district outside of the timber reserve.

SOUTH DAKOTA

According to the report of the State Mine Inspector, recently filed at Pierre, the gold production of the Black Hills for the past year was $4,921,304, which is a decrease of $1,500,000 from what has been considered the normal production. The cause of the decrease is ascribed chiefly to labor troubles at the Homestake mine.

LAWRENCE COUNTY

The first dredge built in the Black Hills is being constructed at Mystic, a short distance below famous old Castleton, in a neighborhood that has produced placer gold for more than thirty years. The plant will be operated by electricity, generated in a station close to the Burlington tracks, where steam coal will be delivered at a reasonable figure. The dredge will have a capacity of 1000 yards a day, and will be running within three months, if the winter is not too severe.——In the death of Moses E. Thompson the West lost one of its well-known men. Mr. Thompson had operated in nearly every important Western camp at some time during more than fifty years of experience. His biggest strike was in the Lady Franklin, in New Mexico, 25 years ago. He had mined in California, Montana, Nevada, on the Comstock, and in other Western States, coming to the Black Hills 12 years ago. He was a successful man.

UTAH

BEAVER COUNTY

The Horn Silver M. Co., whose mine is at Frisco, has decided to construct a new concentrating mill of 75 tons daily capacity, for treating its complex ore, which contains zinc, lead, silver, and gold. It is stated that the mine contains a big tonnage of ore broken and available. The tailing dump contains about 100,000 tons of material, estimated to run 6% lead, 6% zinc, and 4 oz. silver per ton. M. C. Morris, of Salt Lake, is the company's manager.

BOX ELDER COUNTY

The Salt Lake Copper Co., whose mine is close to the western border of this county, is shipping 150 tons of iron ore daily to the Murray smelter. The ore carries 56% Fe, 3% being deducted for silica. The mine, which is in the Pilot Peak range, has an aerial tramway over which the ore is transported to bins at the base of the mountain. A 4-mile railroad spur extends from Tecoma station to the shipping bins.

JUAB COUNTY

The Opohongo, in Tintic district, has been well developed and is in position to ship ore regularly. Orders have been given to build a spur to the mine from the main line of railroad. The principal development is on the 500-ft. level, though it is claimed ore has been opened on the 900-ft. level. It is stated that the expense of development has been paid from proceeds of ore sold. The mine is in the neighborhood of the Black Jack, Ajax, and Gold Chain, and is managed by William Hatfield. The ore carries gold and copper.——The Chief Consolidated, situated close to the town of Eureka, has a new body of ore sampling 100 oz. silver per ton; it was struck by driving southward on the 1400-ft. level, and is one of a series of parallel ore-bodies which have been intersected. At the sub-level, 28 ft. below the 1400-ft. level, and 300 ft. south of the main cross-cut, a well-defined ore-shoot has been opened, and the miners are driving for the same shoot on the 1500-ft. level. In 19 months the Chief production was sufficient to pay all operating expenses and make a net earning of $28,000. The October earnings are given at $25,000. Walter Fitch, the manager, states that the advance in the price of silver has greatly benefited the Tintic district mines.

SALT LAKE COUNTY

The mill of the Utah-Apex company is undergoing repairing and overhauling. Recently a find of silver, lead, and copper ore was made in driving the Parvenu adit on this property; also, a new body of silver-lead ore was opened in driving on the south branch of this adit. It is said a body of copper ore was encountered in making a raise from No. 7 level. During the next four months no milling ore, but shipping ore only, is to be mined. This will permit the use of the principal drilling force on development work.

SUMMIT COUNTY

The Columbus Con. M. Co., operating at Alta, has levied assessment No. 4 of 10 cents per share, for the purpose of meeting certain obligations and to continue development work. Tony Jacobson, the manager, states that the ore now exposed is too low in grade to enable the company to pay operating expenses.

CANADA

BRITISH COLUMBIA

(Special Correspondence.)—The Le Roi mine resumed shipments the past week, sending a small tonnage to Trail smelter. The future operations of this mine cannot well be determined at this moment, though it is stated the property is likely to be taken over by a company with plenty of capital.——The shipments of ore and concentrate from Rossland district for the week ended November 12 were 4526 tons; and for the year ended that date, 203,457 tons.

Rossland, November 19.

(Special Correspondence.)—The coal mine of the Boundary Mining & Exploration Co., near Midway, shipped its first car of coal the past week. Work is being continued on the two seams. Buildings are being erected on the property recently acquired on Myers creek, nine miles from Midway, by a local syndicate. A government analysis of the coal of this locality showed 69% fixed carbon and 8% ash.——The Greenwood smelter of the British Columbia Copper Co. is producing copper at the rate of a million pounds per month, and gold and silver valued at $75,000. ——The Nickel Plate mine of the Hedley Gold Mining Co. is producing 4500 tons of ore per month, of an average value of $12.8. The treatment of this ore in the company's 40-stamp mill results in an average recovery of $11.25, mining and milling costs being $5.47, leaving an average net profit of $5.78 per ton. For the year ended August 31, 1910, the earnings were $284,403, and $143,520 was paid in dividends.——The shipments of ore from Boundary district for the week ended November 12, 1910, were 33,145 tons, of which 19,370 tons was from the Granby mines. District shipments for the year ended this date were 1,443,401 tons.

Greenwood, November 19.

(Special Correspondence.)—A 6-drill Rand air-compressor and drilling plant have been purchased for the Lucky Jim zinc mines at Three Forks. Development work will be carried on all winter, and the mine is expected to be ready for shipping ore in the spring. Occasional shipments of silver-lead-zinc ore may be made during the winter over snow roads to Three Forks.——Development will be pushed on the Pingree mine this winter.——The Granite-Poorman near Nelson is to be operated on a larger scale. The property is now in control of Thomas Gough and associates. It is estimated the ore in the stopes will yield a net profit of over $155,000. During the past year about 10,500 tons of ore has been put through the mill, the net profits from which were close to $26,000.——The ore and concentrate shipments from the Slocan-Kootenay district for the week ended November 12 were 6609 tons.

Nelson, November 19.

ONTARIO

(Special Correspondence.)—B. E. Cartwright, president of the Temiskaming Mines of Cobalt, has organized the Pearl Lake Gold Mines, Ltd., to take over the four Cartwright properties at Pearl Lake, in the Porcupine district. Preliminary work on these properties is said to have opened between 50 and 60 veins, 12 of which show free gold on the surface.——In the southwest corner of claim No. 13,710 several veins have been uncovered which are believed to be an extension of the vein system on the Timmins properties. Some of these veins show free gold.

Cobalt, November 19.

(Special Correspondence.)—John P. Heffernan, of Montreal, one of the largest owners of the Crown Chartered company and vice-president of that company at Porcupine, has assumed active control of development. A large force will be employed.

Porcupine, November 10.

MEXICO

CHIHUAHUA

La Republica operations, out from Ocampo, for October resulted as follows: Ore milled, 1163 tons; gross returns, ₱73,655.63; operating costs, ₱46,457.13; construction costs, ₱1,484.57; surplus, ₱25,711.93.——The Rio Plata Mining Co., with offices in New York, has been chartered under Mexican laws; its subsidiary, the Compañia Minera Rio Plata, will go out of existence. The mine is in Chihuhua, 85 miles from the Kansas City, Mexico & Oriental railway. The output, amounting to 85,000 oz. of silver per month, is carried by mule to Sanchez station; quarterly dividends are paid at the rate of 8% per year.

SONORA

It is announced that the Greene-Cananea Copper Co. will smelt the concentrate produced at the mill of the Miami Copper Co. at Globe, Arizona. Bins of 500-ton capacity are being built at the smelter for receiving this product. A mechanical drier is also being installed.

Company Reports

CAMP BIRD LIMITED

The Camp Bird Limited has issued its annual report for the year ended April 30, 1910. It shows that after treating 79,914 tons of ore there remained 45,500 tons of ore broken in the stopes with 38,000 tons estimated as blocked out, making a total of 83,500 tons of ore in reserve. From the ore treated during the year an extraction of 95.8% was obtained, yielding $33.18 per ton in gold. The cost, exclusive of depreciation, was $6.93 per ton, with the addition of 47 cents for taxes and $1.55 for development. The bullion shipped during the year was valued at £544,032, making a total in the past eight years, since the Walsh agreement, of £3,385,878. During the past year dividends were paid amounting to £178,000. Total dividends since 1903, £1,285,000.

MONTANA TONOPAH MINING CO.

The annual report of the Montana Tonopah Mining Co. for the fiscal year ended August 31, 1910, has been recently issued. It shows that during the year 50,245 tons was mined, all of which was milled. This ore had a gross value of $15.22 per ton, which returned in the mill $650,405.11. Total expenditures amounted to $515,689.71, leaving a net profit of $134,715.40. No custom ore was milled during the year. In addition to mining and hoisting over 50,000 tons of ore, 19,000 tons of waste was hoisted and trammed to the dumps, although the greater part of the waste resulted from development amounting to 10,861 ft. Labor costs were distributed as follows: Breaking ore, 84.4c. per ton; timbering, 2.11c.; hoisting and dumping, 25.4c.; blacksmithing, 3.8c.; surveying, 3.9c.; foremen and bosses, 7.5c.; sampling, 1.9c.; assaying, 2.7c.; sorting and shoveling, 61.8c.; tramming, 33.7c.; watchmen, 1.4c., and storekeeper, 1.1c. per ton. Supplies cost as follows: Breaking ore, 39.2c. per ton; compressed air, 10.8c.; timber, 20.1c.; hoisting and dumping, 8.4c., and hoisting-electric, 12.5c. per ton. Development cost $84,388.72, or $1.826 per ton of ore handled. Milling cost $174,445.80, or $3.798 per ton. The report appears to be complete, giving much of the detail of operations in both mine and mill, which too often is lacking in company annual reports.

FEDERAL MINING & SMELTING CO.

The report of this company covering the operation of its Coeur d'Alene mines through the year ended August 31, 1910, is frank, though not particularly encouraging. The company is in metallurgical difficulties at the Morning, its leading mine. The reserves here stand at 543,000 tons, but a change in the character of the ore makes it uncertain how much will be realized. Experiments with Macquiston tubes are in progress. If no suitable method of treatment be found, W. Clayton Miller, the general manager, recommends that this particular mine be closed rather than waste ore reserves carrying 7 to 8% lead by recovering only 60%. If the recovery can be brought up to the customary 80%, the mine will do well. At Wardner the reserve is 313,600 tons, about equal to two years' supply, making an average of 41,080. At Mace the reserve is 234,675 tons, about one year's supply. The reserve decreased 33,305 tons within the year. Settlement of the litigation between the Federal and Bunker Hill companies was effected within the year and the preliminary trials of cases arising from alleged damage from tailing in the streams have been decided favorably to the company. Suits brought by the Government to recover for timber have been satisfactorily adjusted. The profits from production amounted to $745,053, the total value of the output being $4,757,468. From stocks owned by the company and other sources the total income was brought up to $830,201. Dividends were paid on the preferred stock to the amount of $839,027, and the surplus balance was $1,015,109. Mr. Miller recommends the purchase or development of other properties in order to assure the future of the company.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS

FAILURE TO PERFORM STATUTORY DUTY — ASSUMPTION OF RISK

A miner in a coal mine does not assume the risk of danger by continuing service at a time when the owner or operator of the mine has failed to perform a statutory duty, and in an action for an injury caused by the failure to perform such statutory duty the complainant need not negative the miner's knowledge of such dangers.

Vandalia Coal Co. v. Yemm, (Ind.) 92 Northeastern 49, June, '10.

LOCATION OF MINE ON PUBLIC MINERAL LANDS — MARKING BOUNDARIES

The United States statutes provide that locators of all mines on the public domain so long as they comply with the laws of the United States and with the State and local regulations not in conflict therewith, shall have the exclusive right of possession. They also provide that miners of each mining district may make regulations not in conflict with the laws of the United States or with the laws of the State. Such statutes grant authority, by inference, to the State to add to the general location requirements when not in conflict with United States laws. Accordingly where the United States statutes require that, when a discovery has been made within the limits of the claim sought to be taken, the location be distinctly marked on the ground so that the boundaries may readily be traced and the record of the location shall contain the names of the locators together with a description of the claim by reference to some natural or prominent monument as will identify the claim, the requirements of the Colorado statute providing that before the filing of a location certificate the discoverer shall locate his claim by posting a notice thereon and marking the surface boundaries with substantial posts at each angle of the claim, are valid and are not in conflict with the Federal statutes but merely add to its general terms.

Saxton v. Perry, (Colo.) 107 Pac. 281, Feb. '10.

CONTRACT FOR LEASE OF MINING LANDS WITH OPTION OF PURCHASE

A land owner entered into a contract with a corporation for a lease of land for the purpose of mining with an option to purchase the same and, in case of purchase, the first payment was to be made at a stated time and the deed to be executed when such payment was made. The contract or lease provided that the lessee should pay rent on the buildings and royalties on all the iron mined. Before the first payment became due a new contract was entered into by which the first payment was greatly reduced, the deed to be made as under the old agreement, and the new contract provided that the corporation might retain possession of all parts of the premises as were then occupied, and pursue the business of mining for ores "during and until this contract is finally consummated as contemplated on the first day of September 1907." The mining operations were continued after the execution of the second contract the same as before, but no payment was made and no deed executed; however, the owner received the royalties thereafter until the operations of the mine were stopped for lack of funds, and a chattel mortgage given on all the mining machinery. In an action for an injunction by the land owner to prevent such lessee from removing the mining machinery and tools from the mine and land, it was held that the second contract would be construed as a lease with option to purchase, though standing alone it was a contract for the sale of land; and on this construction the lessee could mortgage or sell the machinery as personalty, and under the lease as the tenant at the expiration of the option was a tenant at will he had the right to remove all mining machinery placed on the land which did not become fixtures after the termination of the lease.

Powell v. Plank, (Mo.) 125 Southwestern 836, Feb. '10.

ILLINOIS COAL STATISTICS

The following statistical statement of the coal mines of Illinois for the years ended June 30, 1909 and 1910, by David Ross, secretary of the Bureau of Labor Statistics for Illinois, is of unusual interest. The output for 1910 is but little below that of the previous year, notwithstanding the suspension of mining for three months owing to labor troubles. It is evident the mining equipment is for an advance of present requirements. Aside from the Cherry disaster, in which 259 lives were lost, the fatalities were below those of any previous year since 1892.

	1910.	1909.
Number of counties producing coal..	55	55
Number of mines and openings of all kinds	881	886
New mines or old mines reopened during the year	86	81
Mines closed or abandoned since last report	91	117
Total output of all mines in tons of 2000 lb.	48,717,853	49,163,710
Number of shipping or commercial mines	390	384
Total output of shipping mines, tons.	47,225,291	47,958,562
Number of mines in local trade only.	491	502
Output of local mines, tons	1,492,652	1,205,148
Total tons of mine-run coal	10,220,456	8,715,759
Total tons of lump coal	20,769,930	21,680,602
Total tons of egg coal	3,334,059	3,444,612
Total tons of nut coal	2,846,693	2,944,036
Total tons of pea coal	10,174,617	10,587,057
Total tons of slack coal	1,372,038	1,791,644
Total tons shipped	43,007,015	43,894,902
Tons supplied to locomotives at the mines	886,217	1,023,294
Tons sold to local trade	2,867,871	2,316,778
Tons consumed (or wasted) at the plant	1,956,750	1,928,736
Average days of active operation for shipping mines	179	189
Average days of active operation for all mines	171	168
Average value per ton all grades at shipping mines	$1.016	$1.012
Aggregate home value of total product	$50,204,207	$50,303,757
Average value per ton all grades at all mines	$1.031	$1.023
Number of motors in use underground	216	210
Number of mines in which mining machines are used	114	107
Number of mining machines in use..	1,291	1,246
Number of tons undercut by machines	18,176,254	16,407,692
Number of tons mined by hand	30,541,599	32,756,018
Average number of miners employed during the year	39,069	50,834
Average number of other employees underground	28,137	13,788
Average number of boys employed underground	1,154	1,752
Average number of boys employed above ground	47	71
Average number of other employees above ground	6,227	6,288
Total number of employees	74,634	72,733
Number employed at shipping mines	71,520	69,518
Number of persons at work underground	68,360	66,374
Number employed at local mines	3,114	3,215
Number at work on surface	6,274	6,359
Average price paid per gross ton for hand mining, shipping mines	$0.597	$0.593
Average price paid per gross ton for machine mining	$0.462	$0.460
Number of kegs of powder used for blasting coal	1,254,095	1,280,607
Number of kegs of powder used for other purposes	3,128	3,963
Number of men accidentally killed (Cherry mine disaster, 259)	390	213
Number of men injured so as to lose a month or more of time	737	894
Number of gross tons mined to each life lost	124,917	230,816
Number of employees to each life lost	191	342
Number of deaths per 1000 employed.	5.2	2.9
Number of gross tons mined to each man injured	66,103	54,993
Number of employees to each man injured	101	93
Number killed to each million tons produced	8.0	4.3
Number injured to 1000 employed	9.9	10.7

LEAD AND ZINC prices at Joplin recently have improved. Although $47.50 was the base price for 60% zinc ore last week in the district, some selected ore sold as high as $49.50. Zinc silicate sold at $24 to $26 per ton for 40% ore. The average price for all grades was about $42.80. The highest price paid for lead ore was $54 per ton. The total value of zinc and lead ores from the district for the first 46 weeks of the year is in excess of $12,175,000.

THE OCTOBER TRADE STATEMENT shows that during October total imports amounted to $123,869,000; total exports during the month were $208,757,000. In the first ten months of 1910, imports amounted to $1,296,245,000, and exports to $1,430,968,000, showing an excess of exports over imports of $134,723,000. Exports reached a higher figure during the first ten months of this year than any similar period since 1907.

COBALT, the famous silver district of Ontario, Canada, will have output during the year 1910 about 2,000,000 oz. more than in 1909, while the total selling value of the year's production will probably reach $3,000,000 more than last year. The total output for 1910, it is estimated, will reach 31,700 tons of ore, containing 27,259,420 oz. silver, valued at $14,720,000. The increased price of silver is materially aiding the profitable operation of Cobalt mines.

The GOLDFIELD CONSOLIDATED mine closed its fiscal year October 31. During the year the gross output was $10,850,000 in gold, making it the largest single contributor to the gold output of the world. Dividends to the amount of $7,117,696 were paid, which placed it at the head of the list of gold dividend paying mines. The net earnings exceeded dividends by $287,915. At the close of the fiscal year the company had in cash and bullion about $2,000,000.

THE VISIBLE foreign copper supply shows a material falling off, it having been reduced about 60,000,000 lb. since March 1 last. There was a decrease during the first two weeks of November of 3,837,120 lb. On November 15 the total foreign visible supply was 194,228,100 lb. From July 1 to November 1 the total world's supply decreased from 401,139,697 to 339,327,194 lb., being about 16% in four months. The supply of copper in the United States is decreasing as well as that abroad.

THE IRON INDUSTRY has long been considered by many as the most reliable index of the industrial condition of the country. At present the production is decreasing, iron in some instances selling below cost, so it is stated. Such cases are probably exceptional, however. Last February the furnaces of the country were producing at the rate of 85,616 tons per day. In October the rate of production was 67,335 tons per day, and in September 68,476 tons. It is stated that the November production will be still lower than that of October, due largely to the banking of furnaces operated by steel companies. In 1909 the total production was 25,795,474 tons. The total for 1910 is estimated at 24,677,275 tons.

Personal

Professional men are invited to send items of their engagements and travels. Such news is interesting to friends.

THOMAS T. READ is in London.

VICTOR BRASCHI is in New York.

W. E. DOLLY is now in Sonora, Mexico.

KARL ELLERS was in San Francisco Tuesday.

E. B. KIRBY was in San Francisco this week.

R. H. CHANNING was in San Francisco Tuesday.

C. C. BROADWATER was at Los Angeles this week.

L. G. PERRIN, of Twin Falls, Idaho, is in San Francisco.

WILLIAM KNOX is back in San Francisco from Brazil and London.

W. H. LANAGAN has returned to San Francisco from Nome for the winter.

GEORGE OTIS SMITH has returned to Washington, D. C. from California.

M. M. JOHNSON, of Salt Lake, has gone to Ely to inspect the Ely Central.

H. M. THOMPSON, of Redding, California, was in San Francisco this week.

J. R. PEMBERTON will go to the Argentine Republic to make geological surveys.

ALFRED FRANK, formerly of Butte, is manager for the Ohio Copper Co., Bingham district, Utah.

W. J. ELMENDORF is manager for the Portland Canal M. Co., operating at Stewart, British Columbia.

GEORGE SKEAVINGTON, superintendent at the Tajo de Dolores mine, Guanajuato, Mexico, is in New York.

HENRY KRUMB, consulting engineer for the Inspiration Copper Co., Miami, Arizona, has returned to Salt Lake.

H. V. WINCHELL is expert witness for the Anaconda, and W. H. WEED for the Butte Ballaklava company in litigation at Butte.

A. C. VEACH, A. R. SCHULZ, and E. E. SMITH have resigned from the U. S. Geological Survey to go to Venezuela for the Barber Asphalt Company.

WILLIAM R. JEWELL has returned to Bakersfield from Sacramento, California, where he has been engaged as expert witness for the defendants in the case of the United States v. H. N. Brown, involving placer property in Plumas county.

THE SAN FRANCISCO SECTION of the Mining and Metallurgical Society of America gave a dinner in honor of George Otis Smith, Director of the United States Geological Survey, at the Palace Hotel, November 22. Those present were Messrs. G. O. Smith, A. C. Lawson, W. C. Ralston, W. H. Metson, W. H. Lanagan, C. H. Munro, Ross B. Hoffmann, Charles Janin, C. G. Yale, Charles Butters, E. B. Kirby, F. G. Cottrell, E. A. Hersam, F. G. Kay, William Forstner, T. L. Oddie, W. P. Hammon, M. L. Requa, A. F. L. Bell, John Barneson, S. W. Morshead, Frank Griffin, E. H. Benjamin, E. C. Hutchinson, C. T. Hutchinson, J. A. Taff, G. D. Louderback, L. J. Pepperberg, Chester Naremore, and H. F. Bain.

CHARLES H. TUCKER, secretary and treasurer of A. Leschen & Sons Rope Co., St. Louis, died at Clifton Springs, New York, Sunday afternoon, October 30. He was one of the best informed and most extensively known men in this country identified with the wire rope industry. Mr. Tucker was born in New York City 50 years ago. While yet a young man, he entered the New York office of John A. Roebling's Sons Co., advancing steadily in their service until 1898, when he went to the firm of A. Leschen & Sons Rope Co., with which he remained until his death. Mr. Tucker became ill on the train while on a short business trip to the Pacific Coast in July, but with characteristic determination finished his business. He was a man of great ability and his death will be widely regretted.

Market Reports

LOCAL METAL PRICES

San Francisco, November 23

Antimony	17–17½	Quicksilver, flask	61–62
Electrolytic Copper	16¾–17	Tin	38½–39
Pig Lead	4.75–4.85	Spelter	5.75–5.90
Zinc dust, 100-lb. casks, per lb.	9½–10	Zinc sheets, casks, per lb.	8½–9

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead	Spelter	Silver, per oz.
Nov. 17	13.50	4.40	6.00	53½
" 18	13.50	4.40	6.00	53½
" 19	13.75	4.50	6.00	53½
" 20	Sunday	No market		
" 21	13.75	4.50	6.00	53½
" 22	13.75	4.50	6.00	53½
" 23	13.75	4.50	6.00	53½

ANGLO-AMERICAN SHARES

Cabled from London

	Nov. 19 £ s. d.	Nov. 23 £ s. d.
Camp Bird	1 10 0	1 12 0
El Oro	1 5 0	1 6 0
Esperanza	1 17 6	1 19 0
Dolores	1 0 0	1 0 0
Oroville Dredging	0 7 0	0 7 0
Mexico Mines	7 15 0	7 7 0
Tomboy	0 18 1½	0 18 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON

	Closing prices, Nov. 21.		Closing prices, Nov. 22.
Adventure	8	Mohawk	48
Allouez	43½	North Butte	5
Atlantic	7	Old Dominion	41½
Calumet & Arizona	193	Osceola	129½
Calumet & Hecla	585	Parrot	13
Centennial	17	Santa Fe	1¼
Copper Range	71	Shannon	12¾
Daly West	3½	Superior & Pittsburg	14¼
Franklin	11	Tamarack	69
Granby	44	Trinity	35½
Greene Cananea, ctf	71	Utah Con.	23¾
Isle Royale	19½	Victoria	2¼
La Salle	7½	Winona	9½
Mass Copper	9¾	Wolverine	136

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Nov. 21.		Closing prices, Nov. 22.
Amalgamated Copper	69¼	Miami Copper	20
A. S. & R. Co.	86½	Mines Co. of America	47
Braden Copper	41½	Montgomery-Shoshone	1
B. C. Copper Co.	6¼	Nevada Con.	20¼
Butte Coalition	20	Nevada Utah	1
Chino	28⅜	Nipissing	10⅞
Davis Daly	1½	Ohio Copper	1½
Dolores	4¼	Ray Central	2¾
El Rayo	3½	Ray Con.	20½
Ely Central	1/16	South Utah	1¼
First National	2	Superior & Pittsburg	14¼
Giroux	7½	Tenn. Copper	36⅞
Guanajuato Con.	⅝	Trinity	6
Inspiration	9½	Tuolumne Copper	5¾
Kerr Lake	7¾	United Copper	4¾
La Rose	4⅝	Utah Copper	19½
Mason Valley	10¼	Yukon Gold	3⅝

SOUTHERN NEVADA STOCKS.

San Francisco, November 23.

Atlanta	8 13	Mayflower	5
Belmont	4.45	Midway	19
Booth	8	Montana Tonopah	1.00
Columbia Mtn.	3	Nevada Hills	2.30
Combination Fraction	21	Pittsburg Silver Peak	50
Fairview Eagle	45	Rawhide Coalition	5
Florence	1.75	Rawhide Queen	——
Goldfield Con.	8.15	Round Mountain	8
Gold Kewenas	8	Silver Pick	8
Great Bend	3	St. Ives	14
Jim Butler	29	Tonopah Extension	1.05
Jumbo Extension	21	Tonopah of Nevada	8.40
MacNamara	25	West End	53

(By courtesy of San Francisco Stock Exchange.)

Recent Publications

UNDERGROUND WATERS FOR FARM USE. By M. L. Fuller. U. S. Geol. Surv. Water-Supply Paper No. 255. Pp. 58. Ill. Washington, 1910.

MINERAL PRODUCTION OF CALIFORNIA. 1909. California State Mining Bureau. Bull. No. 58. San Francisco, 1910. Tabulated statement of mineral production of California by counties.

GEOLOGY AND WATER RESOURCES OF THE SAN LUIS VALLEY, COLORADO. By C. E. Siebenthal. U. S. Geol. Surv. Water-Supply Paper No. 240. Pp. 128. Ill., index. Washington, 1910.

CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1908. Part II. Mineral Fuels. By Marius R. Campbell and others. U. S. Geol. Surv. Bull. 381. Pp. 559. Maps, index. Washington, 1910. Deals with coals and oil as fuel.

CLAYS AND CLAY INDUSTRY OF WASHINGTON. By Solon Shedd. State College of Washington. Pp. 341. Ill. Index. Pullman, Wash., 1910. This volume gives in detail a review of the clay deposits and the clay industries of the State of Washington.

RECONNAISSANCE OF PART OF NORTHWESTERN NEW MEXICO AND NORTHERN ARIZONA. By N. H. Darton. U. S. Geol. Surv. Bull. 435. Pp. 88. Ill., index. Washington, 1910. A geological sketch of the interesting region covered by the title.

BEHAVIOR OF FIRE BRICKS UNDER LOAD CONDITIONS AT TEMPERATURE OF 1300°C. By A. V. Bleininger and G. H. Brown. From Trans. Amer. Ceramic Society. Pp. 33. Ill. Describes the effect of high temperature on fire-bricks when under pressure.

ZINC MINING IN TENNESSEE. By Samuel W. Osgood, Geol. Surv., Tennessee. Extract Bull. No. 2, Mineral Resources of Tennessee. Pp. 17, Ill. Nashville, 1910. Deals with character of ore, methods of mining and milling, and present condition of the zinc mining industry in that State.

WATER POWERS OF THE CASCADE RANGE. Part 1, Southern Washington. By John C. Stevens. U. S. Geol. Surv. Water-Supply Paper No. 253. Pp. 94. Ill., maps, index. Washington, 1910. A valuable exposition of the possibilities of power from the streams of southwestern Washington.

GEOLOGY AND ORE DEPOSITS OF HEDLEY MINING DIRTRICT, BRITISH COLUMBIA. By Charles Camsell. Canada Department of Mines, Geol. Surv. Branch. Memoir No. 2. Pp. 218. Ill., index, maps. Ottawa, 1910. A description of the valuable Nickel Plate mines and their development, together with description of the tramway 15,000 ft. in length and 4000 ft. difference in elevation between terminals. Other mines in the vicinity are also described.

COMPARATIVE STATISTICS OF LEAD, COPPER, SPELTER, TIN, ALUMINUM, NICKEL, QUICKSILVER, AND SILVER. Compiled by the Metallgesellschaft, the Metallurgische Gesellschaft A.-G., and the Berg und Metallbank, Aktiengesellschaft, Frankfort on the Main, 1910. Pp. 111. This is the sixteenth annual issue of this exhaustive compilation of the statistics of production and consumption of the metals named in the title.

MODERN MINING IN MICHIGAN

Development of the great deposits of iron ore in the Menominee range, in upper Michigan, is progressing rapidly. Some of the most important mines of that region have been heavy producers for 25 years and will continue to make a large output for many years more, as determined by the systematic boring by means of diamond-drills. One of the mines which promises to develop into a large producer is the Buckeye, owned by the Reserve Mining Co. Its output in 1909 was only 50,000 tons, but this will be more than trebled the present year, and succeeding years will see the output largely augmented as more extensive development makes greater output possible. The mine workings are a mile and a half south of Commonwealth, Wisconsin. The ore is medium hard hematite, running well in iron content, and of excellent grade for furnace work. It breaks in good-sized lumps, which makes it desirable to mix with the fine ore of the Mesaba range. A single-compartment shaft has been sunk 300 ft. and stoping is in progress on three levels. The shaft will be sunk 200 ft. during this winter and levels opened at 400 and 500 ft. The ore is mined by back-stoping. From the main-level drift, raises are driven to a height of 15 ft. and timbered for use as chutes. One raise is driven from level to level for ventilation. The ore is broken into the chutes, and the pile carried up almost to the level above. In this way about two-thirds of the ore can be stocked in the mine during the winter months. When the stopes are finished, the ground left between the levels is shot down into the chutes. The manways are carried up in the rock, and small drifts opened into the stope as the pile grows. This differs from some Western practice in which square-set timbered man-ways are carried up at either end of the stopes, sets being added as the pile grows higher.

Sullivan Hammer-Drill Block-Holing.

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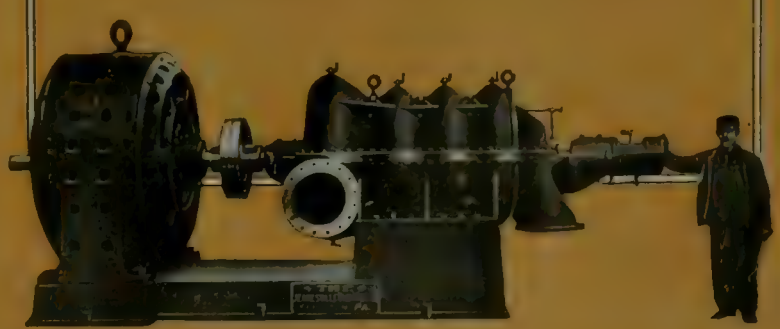

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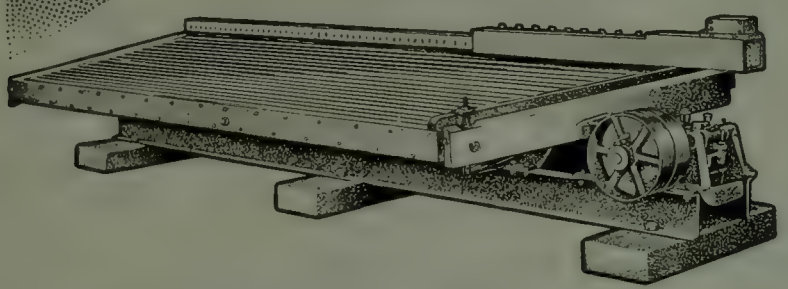

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EDITORIAL

THE WINTER MEETING of the Geological Society of America will be held at Pittsburg, Pennsylvania, December 27 to 29. Mr. Arnold Hague will preside and the sessions will be held in the Carnegie Museum.

RENEWED activity on the part of the United States postal authorities against certain promoters of mining, oil, and other stocks, the merits of which have been grossly misrepresented to the public through the medium of the mails, is gratifying.

NOME is described most interestingly in the mining and dredging edition of *The Nome Daily Nugget* of October. Readers of this handsome special issue can not but be impressed with the fact that the era of great dredges which has supplanted that of the pan and sluice, is likely to be long and profitable.

THE HECLA MINE at Burke, Idaho, is one of the most interesting properties in the Coeur d'Alene district. Discovered by poor men and with but small initial capital, it has paid a total of $2,070,000 in dividends and evidently has a prosperous career still in store. In our news columns recently the amount of the total dividends was misstated, and we are glad to make this correction.

CALCULATION of recovery in concentration, where there is no opportunity for making a complete mill test, must often be undertaken even though the result is necessarily of but approximate accuracy. Formulas for making such calculations have recently been published by Mr. Theodore J. Hoover in *The Mining Magazine* and the *Engineering and Mining Journal*. Messrs. Dietz and Keedy have shown that the formula employed by Mr. Hoover is not new and state that they have used it for "the past five or six years." They further say that Mr. Rudolph Gahl, of Morenci, Arizona, proposed the same method of calculation "about a year and a half ago." In view of these facts it is interesting to note that in the issue of the *Mining and Scientific Press* of September 21, 1901, there was a contribution by Mr. Jesse Scobey under the title 'Sampling Mill Work' in which the matter was discussed and formulas were given which are esssentially the same as those employed by Messrs. Hoover, Dietz & Keedy, and Gahl. Evidently the method of calculation is not new, and Mr. Scobey deserves the credit for having first called attention to its usefulness.

GUSHERS continue to be found in the Midway-Sunset oilfield of California. The latest is the Midway-Premier, which came in about three weeks ago. After a week of most difficult and trying times, during which the well flowed approximately 40,000 barrels of oil per day, it was brought under control November 17. Open reservoirs were at once constructed and when the well broke loose a second time the following Sunday arrangements had been made to care for 750,000 barrels. If the well can not be again controlled quickly, even this storage capacity will be exhausted. The Lake View is flowing steadily and though some of the oil is being moved, the Lake View company has nearly three million barrels in reservoirs. Since other gushers may be brought in at any moment, or those now flowing may cease to do so, it is not surprising that the future price of oil in California is uncertain.

Alaska and Its Problems

Alaska and its needs are discussed with keen insight in the report that Mr. W. E. Clark, the Governor, has made to the Secretary of the Interior. Mr. Clark, while but new to Alaska, is a trained observer and writes with a trenchant pen. He sees the needs of the district and tells about them in a way to attract attention. We trust that Congress may not be too engrossed in routine business this winter to act on his recommendations. Fundamentally, cheap fuel and better transportation facilities are the things most needed. The two are closely related. Better transportation facilities means more railroads, and the latter cannot be built or operated without cheap fuel. At present the coal so abundant in the area cannot be mined because of legal complications regarding titles. This situation should be remedied promptly regardless of the fact that so long as California continues to supply cheap fuel oil, Alaskan coal is not likely to make great headway in Pacific Coast markets. For use at home, however, and specifically for burning in locomotives reaching the coalfields, it is needed; and ways should be promptly found for permitting it to be mined. It seems clear that the tangle regarding existing claims on Alaskan coal lands will not be settled except through long-continued litigation. The issues have become so confused that any executive action would be considered arbitrary and unjust by one or the other parties to the controversy and the whole matter should be given to the courts for adjudication on the basis of law and evidence. At present there is no legal authority for throwing the matter into the courts, though such a solution of the difficulties has been recommended by the Secretary of the Interior. Congress could do no wiser or more popular thing than to promptly provide a means by which these and similar cases could be passed on by a suitable court. It should be remembered, however, that not all the coal in Alaska is covered by the Cunningham and other claims, and that for some years now it has been impossible to acquire coal or coal land in the District on any legal basis. In the meantime, fuel must be imported to carry on all enterprises, including even construction work on railroads to the coalfields. Mr. Clark suggests that a leasing system be established so that it may be possible at once to open such coal mines as local conditions warrant. It is known that Mr. Taft and Eastern leaders in the conservation movement are favorable to this suggestion, and it has this great merit, that if on trial it be found less satisfactory than is anticipated, Congress can at any time enact legislation converting the leases into fees. A leaseholder would be willing to receive the present of full title to the property, while if fee be now given it will be impossible, except by condemnation and purchase, to convert the full title into a leasehold. The conservationists have insisted that it is not now necessary to give everything away in order to secure development. Many of those familiar with conditions in Alaska and the risks involved in investment there, doubt whether the new doctrine is applicable so far away. Probably nothing short of trial will convince the members of either party. Under these conditions Mr. Clark's suggestion is particularly to be commended. Under a leasing system it should be possible to open such mines as are now really needed without undesirably committing the Government for the future. Naturally, the leases should be extremely liberal as to terms.

It is worth recalling that at one time Mr. Roosevelt and officials of the Department of the Interior favored such a system for the remaining coal lands in the Western States and Territories. The principal good expected to be accomplished by introducing it was the prevention of monopolization of coal lands by speculators. Congress, however, considered the change too radical and refused to enact the necessary legislation. Instead, the system of valuing the coal lands as surveyed, and selling them at the prices fixed by the U. S. Geological Survey, was inaugurated. In practice this has worked excellently. While the new prices, although flexible, average much higher than the old flat rates, experience has shown that they are not so high as to discourage development; indeed, the fixing of a price after examination and survey establishes confidence in the value of the lands and makes it easy to secure money for them. As a result, sales in certain districts are more numerous than before. On the other hand, the prices are so high that there is no money to be made by buying lands and holding them for speculation. It is easy to get such coal land as is now needed and money to pay for it, but unprofitable to buy and hold the land for the future. An interesting side-light on the way the system works is thrown by the fact that in eastern Kentucky there are now large areas of excellent coal land which, because their value is not known, can be purchased at about $17 per acre. The same land situated in Montana or elsewhere on the public domain would be valued by the officers of the Geological Survey at $300 or more per acre. The Kentucky land may be profitably purchased for speculation; the corresponding public land cannot. In either case, if a present demand for coal exist, it would be profitable to buy the land and open a mine. Mr. Alfred H.

Brooks whose opinion regarding Alaskan matters is entitled to peculiar respect has suggested that the system be extended to Alaska that the land be priced at its actual value and sold in tracts of reasonable size as fast as needed for development. In his judgment the flat price fixed by the old law is much too low in certain cases and equally too high in others. This system has the merit of involving less change from old methods than does leasing and has the further advantage of having been tried and found to work well in the States. While personally favoring the leasing system for the remaining public coal lands we believe that Alaska should be given every opportunity for development that is afforded to the Western States and Territories. If there be any difference, Alaska deserves more rather than less, and, pending a satisfactory general solution of the problems involved, a system that has been found satisfactory here may be safely extended to the northern District.

Cheap fuel is not the only need of Alaska. It is a means rather than an end. Cheaper and more reliable transportation is equally important, and to that end railroads must be built much more generally. While the country is unusually blessed in the matter of coast and inland water routes, it should be remembered, what many earnest advocates of river reclamation forget, that for most classes of freight steamboat transportation is expensive. It is only where transport in bulk is possible and freight movement extensive and steady that inland water transportation is economical. For ordinary package freight, railroads are superior. We have already published examples of existing freight rates in Alaska that illustrate how heavily industry there is burdened by transportation charges. The amount of freight known to be available is, however, small, and the exact increase to be expected no man can accurately state. Railroad building in the Far North is necessarily an uncertain business, and capital hesitates when asked to undertake other than short lines where traffic is sure. We have already expressed our belief that building a certain number of trunk lines is a National duty. Mr. Clark recommends that the Government guarantee bonds covering construction of such lines as may be agreed upon between agents of the Government and constructing companies. It would seem to us better to adopt some such plan as is now in operation in the Philippine Islands. There is a well grounded opposition in America to the old plan of lending the Government credit to private or quasi-private enterprises while leaving to individuals the whole of the contingent profits. If the people guarantee the investment, why not give them a share in the profits? A plan whereby the constructing company makes its profit out of the operation of the road through a term of years, eventually turning the property over to the Government to operate or to lease to an operating company, as then seems to be best, is fair to all concerned. Whatever plan may be adopted, however, the essential thing is that the United States recognize its duty to provide Alaska with adequate railroad lines. The National credit was drawn on to build the pioneer roads to the Pacific Coast and the whole country has gained greatly as a result. If the part-cost plan adopted in the sixties has proved faulty a better one should be devised. There is as much obligation to connect the interior of Alaska with the coast as there was to give California and the Mississippi Valley easy means of communication.

The Governor's other recommendations are equally pertinent and in the main, sound. His objection to staking ground by use of power of attorney will prove popular in Alaska whatever attention it may or may not receive at Washington. There are good arguments in favor of the system, but the fact is that in practice it works injustice to the man on the ground and hampers development. It should be limited, if not abolished. Whether Alaska is ripe for independent local government is a matter about which opinions differ. The present system has many serious drawbacks, but so, too, would one involving legislation by an assembly composed of individuals resident in towns as widely scattered as are those of Alaska. Under present conditions a commission form of government such as recommended by the President would have many advantages, if the right sort of men were made members of the commission. The proposal is, however, undeniably unpopular in Alaska, and in the States there is great doubt whether a commission would not lead to exploitation rather than development. Probably no fundamental change will be made until the situation becomes clearer and the facts are better understood. In the meantime, Alaska has evidently an intelligent and trustworthy friend in its present Governor.

Honduras in Revolution

Observerers of affairs in the Central American Republic, and particularly in Honduras, cannot have failed to notice the facility with which a full fledged revolution can be launched there, and the equal promptness with which it can be ended. It requires little beyond ambition and a strong personality for any citizen to secure a following in that Republic, and the smallest matter may be considered by the disgruntled politician as a *casus belli*. One of the most serious revolutions with which Honduras ever had to deal was caused by a dispute over a division of the spoils incident to the operation of the Louisiana lottery in that country. At present Señor Valladares has thought it a psychological moment to 'start something' which might add to his political power, and place him at the capitol in the presidential chair. He has seized the fortified island on which is situated Amapala, the only port of entry on the West Coast, and has secured quite a following of the bare-footed soldiery. His chances of being shot are excellent, notwithstanding his claims to the presidency. Honduras has great, though almost wholly undeveloped, mineral resources, but until these frequent riots, dignified by the name of 'revolutions,' cease, the resources will remain untouched, for the reason that capital is not willing to assume the additional risks which the unstable government of that country involves.

BY THE WAY

The following, a portion of an essay on 'The United States and Mexico,' written by James Douglas and published by the American Association for International Conciliation, will be read with especial interest at this time. Mr. Douglas' thorough familiarity with Mexico and his high character lend emphasis to all that he says.

As a miner the Mexican possesses manual dexterity of a high order, but it requires time to eradicate the old habits of mine working, which he and his forbears have acquired through generations of practice. Around a furnace he is at home. Like all dwellers in a tropical or semi-tropical clime, he has never felt the necessity of steady work, and therefore has never habituated himself to it; but he rapidly learns to discard sandals and wear shoes, and to imitate the higher standards of living of his northern fellow-workers. He soon learns that to maintain that position he must make money and work steadily. He therefore abandons his erratic habits. If the managers of foreign companies would temporarily submit to some inconvenience and annoyance, involved in employing more Mexicans and fewer foreign workmen, they would before long not only find it to be to their profit, but they would help to alleviate the smouldering feeling of jealousy and dread which can be used so widely and successfully by such agitators as wish to use the *pro patria* movement for political purposes.

There is no denying that a dread of the overwhelming strength of the United States has always possessed the Mexican mind. Don Pablo Macedo, in his chapter on Railroads, tells us of the conferences which preceded the adoption of the railroad policy in Mexico. He says: "In deciding on the gauge the truth is that the question was discussed, whether or not they should accept the gauge adopted by their neighbors of the Northern Republic. It was a consideration of the gravest moment, and transcended all others. No one, and still less statesmen of the status of Señor Lerdo de Tejada, has ever been blind to the danger that we run from the nearness of our colossal neighbors on the north. In comparison with the United States—more's the pity—we must confess that we then figured, and we still do, as a mere pigmy. Besides this the sad memory of the iniquitous war of 1847, which cost us the half of our territory, is more than enough cause to excite uneasiness and even dread. Such apprehension is certainly not unreasonable or groundless. As a consequence, the distinct object of our international policy has necessarily always been, in the first place, to grow by natural expansion, to fortify our national organisms, and then to seek from the other side of the Atlantic a support which alone can be efficacious by creating, acclimatizing and strengthening European interests and elements. Unfortunately, the unjustifiable French intervention, obliging us to sustain a war *à l'outrance* in order to preserve our very existence as a nation, interrupted our organic development, and not only weakened our position physically, through the material sacrifices which we had to make, but morally by creating divisions greater than had previously existed. The blood of Maximilian created an abyss between Europe and Mexico. His death, though it may have been the only means, sad as it was, of securing internal peace, estranged the sympathies of those nations which then exercised preponderating influence in Europe." (*La Evolution Mercantil por Pablo Macedo*, page 199.) The above extract probably expresses correctly the prevalent feeling among the educated classes in the past and in the present. And it is they alone who can exert political power; for though the franchise is universal, under the Constitution of 1857 and the electoral law of 1901, the vote is really cast by an electoral college, composed of one elector for each 500 inhabitants, and the members cannot be supposed to know the wishes of their constituents as distinctly as those who vote for the President of this country.

Universal suffrage, therefore, in Mexico does not voice the popular will as distinctly as it does in this country; but from one motive or another there is an almost universal and reasonable dread of offending this country, under the belief that the consequences might be disagreeable and fall with lightning speed. Every citizen of the United States who enters the Republic for the transaction of business or to engage in industrial pursuits, through some indiscretion of his own or through some arbitrary act of over-zealous Mexican official, may give rise to international complications. These risks are greater by far in a sparsely settled country like Mexico than in a land where the provincial government is thoroughly organized and under strict control of the central power; and it is difficult to maintain perfect order and to mete out perfect justice where the officials cannot possibly be men trained for their posts. In this rapid influx of foreign capital, under foreign management, the Mexican sees therefore cause for anxiety which is in itself a source of danger; and it cannot be wondered at if their sensitiveness is increased by the memory of the original Texas difficulty, and the fact that till recently the border population from the Atlantic to the Pacific, possessed of irresistible energy, found vent for it sometimes in eccentric enterprises which were not suggested by the State Department. Most wars have originated in trade disputes or commercial jealousy; and so ready are our frontiersmen to avenge any injury or insult that they have not waited for declarations of war before taking the law into their own hands. There have been instances even recently where armed bands have crossed the line to forcibly maintain what they conceived or at any rate claimed to be their rights. Besides which, there are people—presumably well intentioned—north of the line, who, comparing political conditions in their own country with those prevailing in Mexico, consider that interference in favor of their neighbors is a duty. They do not always weigh the difference in the habits and education of the voters, which this arbitrary boundary divides; and that truer liberty may coincide with limited rather than with unlimited franchise during a certain stage of a people's social and political development.

Old-Time Mining Schools and Mining

By W. C. Wyckoff

It is questionable whether during the past fifty years advance in any branch of science tremendous as it has been has been greater than in educational facilities in mining and metallurgy. At the same time it is not certain that the methods of teaching have not lost as well as gained. In the old days because facilities were lacking, there was greater necessity than now for search for authorities and hot discussions, in and out of the class room, took much of the place of data now furnished ready made to the student. Many a wit was sharpened by these discussions, and many a habit of research formed. Fifty years ago there was one mining journal in the United States. There were no mining schools, designated as such; there were no Geological Survey reports and no publications of mining or scientific societies, and no such voluminous mining literature as now which makes it a physical impossibility for one man to separate the wheat from the chaff. It is pleasant to look back, both as student and teacher, and linger in the ruins of the old halls, among the old books, lessons, and work; and their spirit sometimes returns to nerve one to renew youth. The old schools gave little instruction in mining and metallurgy, partly because the spirit of science was not yet awake, but mostly because there was little or no demand for it. Some gave instruction in surveying and chemical laboratory work. In surveying, the present does not seem to have improved on the old methods of teaching. The latter gave an abundance of field work and more in astronomical observations and astronomy than is usual now. In those days the light transit had not been developed; weight in the instrument was considered essential to accuracy. One of the first instruments I used weighed more than thirty pounds. A Confederate sharpshooter permanently knocked it out of commission, and no bullet ever gave me greater satisfaction, unless it was one deposited where it would do the most good in an Indian.

When a boy at the proper age to know everything and then some, I was one of a class which was getting instruction in surveying. Then came the Civil War and I joined others for a ninety-day frolic in the army, which proved to be anything but a frolic, and the ninety days stretched into more than four long weary years. At the end of the war there had been an entire revolution in the course of study in many of the colleges. Holes had been broken in the fence of prejudice which had surrounded progress. The fetish of the classics had died at the same time as did slavery, and the age of science had been ushered in. The first school of mines in the United States to give a degree of mining engineer had been established in Columbia College, and most higher institutions had established courses in science, though they gave no E. M. degrees. The course was in civil engineering with elective studies which were to prepare one to do mining work. These courses consisted of engineering, chemistry with laboratory work, mineralogy, and as much as possible which was little in mining and metallurgy. Mechanical and electrical engineering were of the future. The metallurgy taught was almost wholly of iron and steel and it bore about as much relation to their metallurgy of today as the ox wagon does to the automobile. In the chemical laboratory the instruction was thorough but it included nothing of electro and spectro chemistry. Electric science was not born. The determinations were gravimetric. The volumetric methods were used only for iron and copper, though for both students were also taught to make fire assays. For the latter the method was brought from Swansea, and was used, at one time, to a slight extent on the ores of Lake Superior. In the hands of a master, on ores containing metallic copper, it was claimed to be fairly accurate. It took two days to make a zinc determination, and the many quick methods in use in laboratories had not been developed. If it were necessary to go back to the methods then in use every smelter would require an army of chemists. Accuracy was demanded, and the sloppy student was given a chance to reform, and was given a permanent vacation from the laboratory if he did not do so. Fresenius' book was then, as now, the great text. In mechanics there was a text-book on natural philosophy, with few illustrative appliances in the physical laboratory, where there was such a thing. Especial attention was given to the steam engine. Some schools had a small model of a Cornish jig, a buddle, and perhaps a Rittenger table, but object lessons or practical work in metallurgy were impossible. I supposed concentration was a very simple mechanical operation, devoid of difficulties. It seems to be generally considered so now in California, where the concentration floor is often under the charge of the cheapest labor in the mill. In most of the Rocky Mountain country the most skilled and highest-priced labor is none too good for that job.

The joys of the course were mineralogy and geology. The latter furnished plenty of opportunity for intellectual contests. The science was comparatively new, and discussions about it were often tinged with bigotry and bitterness. Agassiz' theory of the glacial period was only twenty years old, and Darwin's theory about the origin of species was half a dozen years young. Many professors were orthodox preachers, and it was difficult for them to accept the teachings of the geologists. Sermons were thundered from many pulpits denouncing the science which destroyed the theory that the world was only six thousand years old. One noted and learned bishop compared a geologist to a gnat on an elephant, laying down theories about the whole internal structure from the phenomena of the hide, and the whole theological world seemed to think his comparison settled the tribe. Geologists were sometimes ostracised and classed with infidels, and to be an infidel was as bad as to be a criminal. Agassiz opposed Darwin's theory wholly on account

of a missing link in the fossil chain. It was remarkable how he seemed to gain popularity among theologians where he had lately been so unpopular. Some of the wilder students formed a society which they called the Missing Link, and they did such a large and well-assorted lot of things to the proprieties that the president said they were well named, because they were neither Christian nor human, but belonged to the monkey tribe. Many of them for years afterward answered to the nickname of Monk. They adopted a monkey head painted on a cork for a badge. This before long was changed to the famous elk head, and the 'monkey shines' which characterized them at first were changed to something better. College boys tipped over Diogenes' tub, and they will probably continue to tip over tubs as long as there be any.

Looking back at the bitterness of the theologians toward geology, it is not difficult to understand the Inquisition. Grand old Hugh Miller wrote 'The Testimony of the Rocks' and blew out his brains after going insane trying to reconcile the Mosaic account of creation with geology, and one great preacher declared that his act was justified by his impious book. Of mining geology there was little except what was found in the general works. Phillips' ancient work, which was chiefly remarkable for generalizations drawn from insufficient data, was standard. He divided veins into two classes, one of which cropped above the ground and the other which did not, and one of them, I have forgotten which, was pretty certain to be worthless. Van Cotta's classic work was unknown, and there were but faint echoes from the academic groves of Freiberg. What mining was taught dealt almost entirely with coal. Students were told that the maximum depth to which it was possible to sink a shaft was sixteen hundred feet. Having seen something of shafts, drifts, and stopes, I was sometimes called on by a teacher whose practical knowledge of quartz mining was preceded by the minus sign, to tell how some of the work was done.

The years following the Civil War were noted in the Rocky Mountain country, where the ores are more complex and 'refractory' than they are west of the Sierra Nevadas, for an enormous number of patented or secret processes, each of which was guaranteed to revolutionize mining. It was the golden age for humbugs. On account of the character of much of the ore some method of treating it was needed. There are always plenty of self-styled scientists to meet every need, if there is any money in meeting it. The only processes used in the United States were the ordinary stamp-mill, pan amalgamation, and one small Plattner chlorination mill in San Francisco. Smelting had scarcely come into use. Of the hundreds of processes which were born and died, lixiviation was the only one which had any degree of success, or which added anything valuable to the sum of metallurgical knowledge. Every one of the old mining camps in the Rocky Mountains is the graveyard of one or more of these processes. All the great improvements which have been made in smelting, concentration, and milling are the product of slow evolution and not of the inventor's brain. There has been almost, if not quite, as much change in mining and prospecting as there has in the correlated branches. The power-drill and high explosives had not been invented. Black powder only was used. Cartridge paper and a special soap which acted as a glue to assist in making a cartridge, were parts of every mining equipment. The fuse was poor, and tamping so as to avoid injuring it required skilful work. Almost every miner hunted up good clay and carried it with him to the mine for tamping. Missed shots were almost always picked out, and while resulting accidents were common, they were seldom fatal. When the tamping was loosened, as it was in picking it out, the black powder was pretty certain to blow out without breaking rock. Miners with black, powder-marked faces, often blind in one or both eyes, were common. Ore was generally measured by the bushel, as it is now measured in some parts of Colorado by the cord. On the Pacific Coast prospectors never suffered much from hostile Indians. It was far different in Arizona and most of the Rocky Mountains. A rifle and a good dog which would smell an Indian and give warning of his presence were essential parts of a prospector's outfit. Almost weekly there were reports of some who had been murdered by Indians, and if the poetic story of the recording angel be true, his books alone can tell of the many who went out in the morning and were never heard of again.

The copper mines of Lake Superior are wholly unlike copper mines elsewhere. The Lake deposits consist of beds of conglomerate and sheets of amygdaloidal diabase and tuff containing native copper, generally in the form of finely disseminated grains, though occasionally masses of large size have been discovered which had to be cut up into pieces that could be readily handled. The ordinary ore is hoisted from the mines and sent to stamp-mills, where it is crushed and the metal recovered by concentration. The stamp-mills are of a type seldom found elsewhere, being what are known as steam-stamps. They are erected in heavy steel frames and set on massive foundations of concrete with anvil-blocks beneath the mortar, weighing twelve or more tons. The capacity of one of these stamps exceeds 500 tons of rock each twenty-four hours. Similar stamps have been tried at Butte, Montana, on sulphide copper ore, and at the Homestake, in South Dakota, on gold ore, but at both places their use has been discontinued.

The prospector is supposed to be neither a geologist nor an engineer, therefore the law requires him to locate his claim along the course of the vein at the surface, and not necessarily on the true strike as it would be proved by an adit run on the vein. Where veins dip less than 60 degrees from the horizontal and the country is cut by abrupt gulches or canyons, the apparent strike of veins at the surface may be very irregular, though the real course of the vein taken horizontally may be nearly straight.

Mining in the San Juan—II

By William H. Storms

In the San Juan region prospectors seem to have confined their attention to the search for those types of ore deposits with which they are most familiar, neglecting or failing to recognize the commercial possibilities of others. The types that have been worked extensively and successfully are impregnations in quartzite, replacement deposits in limestone, and the fissure veins. The latter are found in both

Tunnel Through Snow Near Ouray.

the older stratified rocks, and in the later volcanic series. The most important veins occur in the volcanic rocks. In a number of places I observed masses of brecciated and silicified limestone which on close inspection almost invariably showed scattered grains and veinlets of pyrite, galena, and blende, indicating the possibility of the occurrence in these highly silicious ores of gold and silver, as well as the sulphides of the base metals. In physical appearance the deposits greatly resemble some of those found in the Black Hills of South Dakota, particularly those in the region about Ragged Top, and in Spearfish canyon near Carbonate. Careful investigation of some of these occurrences near Ouray might result in the discovery of ore sufficiently rich in precious metals to be profitably mined. It is a matter that should receive attention.

A fault, previously referred to, crosses Canyon creek and the Uncompahgre river in the southern outskirts of the town of Ouray, resulting in the up-

[illegible] on the south side of the Ouray Devonian limestone several hundred feet where it is exposed at the Mineral Farm mine and in that vicinity. No prospecting of any description has been attempted in this limestone where it lies beneath the town of Ouray, although it is known to be mineral bearing in this district in several places. It is not probable that ore may be found at every place where the limestone may be penetrated but diamond drilling would prove whether or not the limestone contains deposits of value underneath the town. Any ores found at that depth would undoubtedly be sulphide, and probably of a complex character.

In the southeastern part of Ouray, rising several hundred feet above it, and continuing for a mile or more beyond the town in an easterly direction, is a huge mass of rock detritus that has slipped down from greater height. Although it is covered with a dense thicket of brush, aspen, and pines, its character is still clearly evident, particularly where a stream has cut down through the mass of boulders, clay, and earth. There is no evidence to show that this great landslide has occurred in recent years, though it undoubtedly moved repeatedly, in masses of greater or less size, after the main slide came down. This is indicated by the curiously uneven topography of its surface, generally characteristic of landslide areas. Landslides and glacial moraines are scattered the entire length of Canyon creek, which joins the Uncompahgre in the southern outskirts of the town. Evidence of the former presence of glaciers in these mountains is abundant. In many places the hard rocks in the canyon of the Uncompahgre above Ouray are polished and striated. Not only are the rocks at and near the bottom of the canyons glaciated, but high up on the sides. At the Black Diamond mine, 1500 ft. above the canyon bottom, the hard quartzite has been beautifully planed, grooved, and polished by the passage of the ice. An enormous amount of débris has been carried down from the Uncompahgre and its tributaries by the ice, and many hundred million tons of glacial detritus may be seen piled up in great moraines near the village of Ridgway, down the Uncompahgre river below Ouray.

The San Juan mountains are famed for the num-

Pack Train Crossing Snowslide, Canyon Creek.

Snowslide at Water Hole, Canyon Creek.

ber and size of the landslides that occur there. They range from small, inconsequential slips, some of them of recent date, to masses covering ten or more square miles, whole mountain sides having moved down to lower levels from some higher place. The most extensive of all those in the region is that on the north side of Gold hill, near Telluride, where rock covering a tract of fully ten square miles has slipped down. The landslides are of several kinds and include one peculiar type which appears to have occurred with marked frequency in this region. It has been designated 'rock-streams'. These are numerous and are found at the heads of the various glacial canyons in many of the high amphitheatres, or 'basins', as they are locally called. The United States Geological Survey recently issued, as Professional Paper No. 67, an interesting description of the several landslides of these mountains, under the title of 'Landslides of the San Juan Mountains, Colorado', by Ernest Howe, in which the various types of slides are classified and their origin discussed. This report contains many fine illustrations of landslides, talus slopes, and 'rock-streams'. Various origins have been assigned to the last. Mr. Howe considers the rock-streams to be the result of abrupt rock falls in which great masses of rock became suddenly detached from the nearly vertical cliffs above, and tumbling down, rushed forward from the base of the cliff, forming a long talus of relatively low-angle slope, being entirely unlike the ordinary talus usually found at the foot of cliffs. The slope angle of the latter generally approximates 35 degrees. Mr. Howe quotes Chamberlin and Salisbury* as follows:

"The loose débris on steep slopes sometimes assumes a sort of flowing motion and descends the slope with some such form, and at some such rate as a glacier."

Mr. Howe, commenting on this, says: "Although such explanations might hold true in the case of some of the smallest rock-streams, hardly to be distinguished from ordinary talus, in the writer's opinion they cannot account for the notable examples of rock-streams described in this paper."

I had an opportunity to see several of these unusual and interesting rock-streams, passing along the base of one and riding directly over the surface of two more, besides having an opportunity to view a number of others at a short distance in several of these basins. The streams were in Pierson and Silver basins, above the Atlas and Revenue mines, and in Savage and Marshall basins, near the Tomboy and Smuggler-Union mines above Telluride. In form they resemble glaciers, the corrugated surface, like a series of wrinkles approximately parallel with the advancing front of an ice mass, bearing a remarkable resemblance to crevasses. These I believe to be due to corresponding fissures in the ice formerly present beneath the rock débris. To me it seems that these rock-streams merely represent accumulations of rock fragments on the surface of the last remnants of the glaciers, which at one time occupied these elevated basins. So long as the ice rivers were in motion the rocks falling almost constantly upon them were carried away on their surfaces or embedded in the ice, and were in time deposited in the rock heaps which now form the lateral or terminal moraines in the neighboring canyons, or in the valleys below. When the glacier became so diminished in size because of changing climate that it no longer had sufficient volume to travel down the slope where it lay, the rock fragments falling from the cliffs began to accumulate upon its surface, and today as a result these so-called 'rock-streams' are found. In substantiation of this theory it is interesting to know that at the Tomboy mine in Marshall basin, near Telluride, a raise was driven on the vein which, reaching the solid rock surface, entered and passed through 60 ft. of ice and was then continued upward through a mass of loose rock débris, emerging into daylight on the surface of the rock-stream. There appears no reason to doubt that this mass of clear ice is all that remains of the great glacier that once filled Marshall basin, and the fact that the rock-stream completely covers the ice certainly suggests the correctness of the theory that all the rock-streams in the San Juan mountains owe their origin to a similar cause—that of rocks rolling down from the neighboring cliffs upon the remnants of the glaciers. One of the accompanying illustrations gives an excellent view of a rock-stream at the head of American basin, and is republished by permission of the United States Geological Survey.

On an elevated limestone plateau, several hundred feet above and south of the town of Ouray, is the noted Mineral Farm mine. It was idle at the time of my visit, but a great deal has been done on the property in past years, and open pits are numerous. There are also extensive underground workings reached through shaft and adits. A great deal of sulphide ore is still to be seen in the various workings, and it is not unlikely that when the cost of transportation and ore treatment is lower the property will be again successfully operated. A fault, striking in a northeast-southwest direction, passes through this hill, and it is possible that an extension of the ore-shoots occurring in the Mineral Farm mine may be found in the limestone to the southwest, toward Mt. Hayden. The Mineral Farm mine is equipped with a hoist and concentrating mill. Adjoining this property on the south is the Legal Tender group owned by the Legal Tender Exploration Mines Co., a local corporation, of which I. A. Martin is president, and Edwin J. Canavan is superintendent. In the belief that the ore-shoot of the Mineral Farm extends into the Legal Tender ground, preparations are under way to develop it, and at the time of my visit a shaft had been sunk 100 ft. through what appeared to be landslide material, though at the bottom the rock seemed to be in place and some good-looking ore had been found. A day or two before I visited the place the hoisting engine had been broken and the mine was idle awaiting the return of the piece sent away for repairs. Although the rock in the bottom of the Legal Tender shaft appeared to be in place, it was much shat-

* Geology, Vol. 1, 2nd edition, 1905, pp. 232-233.

tered and still suggested landslide phenomena. In fact, the whole hillside looked as though it was composed of the debris from above the entire mass having slipped downward. However when the shaft has reached a point as low as the bottom of Canyon creek it is likely the formation will be found in place. It is not at all improbable that in the Legal Tender, as in the Mineral Farm, ore may be found in undisturbed formations at a higher point to the southeastward of the fault previously mentioned.

An excellent road has been built up Canyon creek from Ouray to the mines near the head of the forks of the creek. These include the Camp Bird, Revenue, Atlas, San Pedro, Virginius, and a number of

between Ouray and the Camp Bird mill which is situated near the forks of the canyon six miles above Ouray. The most important of these is the Thistledown, which is equipped with a mill run by water power. An aerial tramway connects the mine with the mill. The ore deposits here occur in a quartzite near the top of the sedimentary series, a bed of conglomerate which is the basal member of the Tertiary volcanics, lying a few feet above the mine workings. The Thistledown mine was said to be looking well and improving under development.

Canyon creek occupies the bottom of one of the wildest and most picturesque gorges in the San Juan mountains. The walls of the canyon rise to

Landslide or 'Rock-Stream' at Head of American Basin.
(After Howe, U. S. Geological Survey.)

others less noted. All of the properties mentioned are on the high divide separating Ouray from San Miguel county, and just over the divide from those first mentioned are the Smuggler-Union, Liberty Bell, Tomboy, Japan-Flora, and a number of others. The total production of these mines has exceeded $124,000,000. The cost of road building in these extremely rugged and high mountains is excessive, but the record of the famous mines mentioned shows that the expenditure was fully justified. The road in many places has been blasted from the solid rock, which here and there overhangs the roadway, and in winter the dripping of the water, which freezes as it falls, builds up great icicles at the roadside which have to be broken down with hammers or blasted from time to time to keep them from forming and completely obstructing the passage of teams and pack-animals. There are several small mines

great height on either side, and in many places they are rent from base to summit by fissures, some of which contain ore. Open fissures are numerous. Some are merely great rents in the rocks; others, at one time filled with crushed rock, are now open, the fragmental material having been removed by decay and the wearing away by water, frost, and wind. The mountain-sides consist of a series of vertical cliffs rising one above another, separated by steep slopes which in some places are covered with rocks and soil; in others only bare rock is exposed. Pine, aspen, and a few other species of trees, with some underbrush, grow wherever they can find sufficient soil to support them as far up as timber-line. The altitude of this line varies somewhat, but is seldom lower than 11,000 ft. and not often over 11,500 ft. above the sea. It is surprising to see that in many places good-sized pine trees grow close up

to the line, whereas one would naturally expect them to diminish gradually in size approaching the limit of timber growth.

On these steep mountain-sides snowslides are of frequent occurrence in the spring when the warmth of the sun begins to thaw the winter's snow. Nearly every spring the slides take place and are often disastrous in their consequences. Mills have been destroyed, and many lives lost. Often avalanches can be anticipated and those in the vicinity seek a place of safety until the snow has rushed down into the canyon and the danger is over. At other times they come almost without warning and then all in their path are swept down to almost certain death. Last spring a snowslide came down the east side of Canyon creek about four miles above Ouray and caught a number of men and more than 20 pack-animals. The snow came from a height of more than 2000 ft. above the canyon bottom, gaining momentum with every foot of its fearful flight, plunging wildly into the bottom of the gorge over a vertical cliff several hundred feet in height. It filled the bottom of the canyon and rushed up on the opposite side, covering the roadway and overwhelming men and horses. Only one man escaped, I was told, by jumping quickly behind a boulder, where he was found and dug out by the rescue party. One of the accompanying illustrations shows a tunnel excavated through this snowslide for the passage of vehicles. It was later widened and the cover removed.

In hot-water heating-boilers the steam-gauge shows the height of water in the system in pounds pressure. Before starting up, go to the expansion-tank and see that the water is at the correct height in the tank. Then return to the boiler and make a mark with red paint on the steam-gauge where the needle stands. Use this mark as a guide in filling boiler when necessary. The needle should always stand at this mark when the boiler is in service. Some boilers are provided with altitude-gauges similar to steam-gauges; if provided, their correctness should be tested in the same manner as the steam-gauges by noting their readings when the water is at the correct height in the expansion-tank. In hot-water systems no valves should be allowed in the pipes leading to or from the boiler and heating system, except radiator-valves. If such valves are in, have them removed, for if the valves are inadvertently closed an explosion will occur. An explosion of a hot-water heating-boiler will also occur if it is not directly open to the atmosphere through the expansion tank; it is a duty of the person in charge to trace out the pipe-line from boiler to tank and to know that it is open and safe. No safety-valves are required on hot-water boilers open to the atmosphere through the expansion-tank. Insist on gauge-cocks and water-glass being provided for the boiler as a safeguard.

The water of many hot springs about the vents of volcanoes, whether directly in the crater or not, contains boric acid. Large deposits of colemanite are supposed to be the result of precipitation of calcium borate from springs of this kind.

PERUVIAN PLACER MINES

Important placer work has been undertaken by a company of English and French capitalists under the name of Aporoma Goldfields Limited, at Aporoma, province of Sandia, department of Puno, Peru. This company holds 129 pertenencias or 1277 acres of auriferous gravel, 155 miles from the station of Tirapata on the Southern Railway of Peru, itself distant 310 miles from the port of Mollendo. The Andes are crossed at the Aricoma pass at an elevation of 16,800 ft., and the mines are on a ridge of the eastern slope, 7000 ft. above sea-level. The zone is undoubtedly the bed of an ancient river which some geological disturbance has lifted far above its original level. The gold-bearing stratum lies above a bedrock of blue slate, and varies in depth from 50 to 400 ft., with a width of from 1500 to 1800 yards. The dense undergrowth that now covers it can easily be cleared by burning. The gold is finely divided, averaging something over 40c. per cubic yard of gravel, the gold being 0.935 fine.

The water supply for hydraulicking is mainly from the Cascada de Huayna, about two and a half miles from the upper workings and 200 ft. above them, 400 ft. at the lower end of the property. This source gives a minimum flow of 25 sec. ft. Two other supplies are available at considerable cost, but should not be needed. The disposal of tailing offers no difficulties, for the immediate side boundaries of the property are formed by the Huayna and Pacchani rivers which run at least 1000 ft. below the bedrock and are capable of carrying away any quantity of tailing. Work has been begun on rebuilding the ancient trail from Limbani, which is so overgrown and so steep in places that some £9000 will have to be spent to allow the giants, conduit pipes, and electric-light plant to be taken in. From the railway to Limbani, the cart road of the Inca Rubber Co. will be used. G. Allen Crane of Merricks, Crane & Co., London, engineers for the company, who is general manager in Peru, is at the mine pushing forward the construction and states that well within 18 months extraction of gold will be under way. This is the first large undertaking of this nature in Peru, the only previous work being higher up in the mountains, nearer the Poto glacier, where the Poto hydraulic mines have been operated for several years by an Argentine syndicate whose manager is Mr. Ingolby. These are now producing gold at a good profit. The districts of Sandia and Carabaya have been well known for many years for their richness in placer gold, and it is hoped that the capital that is being brought into Peru for the purpose of exploiting this region will develop an important industry.—*Peru Today.*

Native antimony and stibnite (antimony sulphide) occur in at least two localities in California. One in San Emedio canyon, in northern Kern county, the other two miles southwest of the city of Corona, in Riverside county. There may be other places in California where the native metal occurs.

Origin of Gold 'Pockets' in Northern California

By Oscar H. Hershey

It has long been a question in my mind as to the exact role played by the 'secondary enrichment process' in the production of gold-quartz deposits. Many writers when dealing with the subject go elaborately into the effect of the process in concentrating the salts of such metals as copper and silver, but they seem to have exhausted their energies by the time the gold is reached, dismissing it with a few short paragraphs and scarcely any specific examples. This, with personal investigations in many gold-quartz districts, has led me to believe that the formation of workable gold ores by the secondary enrichment of the upper portion of the sulphide zone has been of relatively slight importance, but I believe the process has not been entirely inoperative in the concentration of gold, and I wish to ascribe to it, or rather to a modification of the process as usually understood, the origin of certain gold 'pocket' deposits of northern California.

When I first entered the western portion of Shasta and the eastern portion of Trinity county, about thirteen years ago, I made the acquaintance of a number of 'pocket hunters' who pointed out a certain contact as preeminently the 'pocket' horizon of the region. This contact is between the Clear Creek volcanic series and the overlying Bragdon slates. The volcanic series consists largely of altered andesites, traversed by rhyolitic bands and bound together by innumerable dikes into a great igneous complex which forms the visible basement rock in much of the country between the upper Sacramento and Trinity rivers. The Bragdon formation consists of several thousand feet of thin-bedded black slates alternating with thick-bedded blue-gray quartzites and conglomerates. It was laid down in a horizontal position on the surface of the volcanic series, but folding and faulting have made the contact very irregular, so that it varies as much as 600 to 1000 ft. in altitude on opposite sides of a narrow ridge. In the valley of the Trinity river, the contact line averages several hundred feet above the stream level between Trinity Center and Eastman Gulch, but in places rises to 700 or 1000 ft., and in others the black slates come down to the river level. Hence, the contact is generally tilted at various degrees up to vertical. At the contact the black rock frequently has a shining lustre and a schistose structure due to shearing. This gives it imperfectly the power of a gouge to deflect underground waters. The volcanic rock near the contact has generally been decomposed, softened, and changed to a dull brown color; it is popularly known as porphyry. In places there is a thin vein of quartz between the so-called porphyry and the black schistose material, but generally they are in actual contact or separated merely by a thin seam of ferruginous dirt. The dirt seam often carries a little free gold, but the pockets are said to be found near or where seams of quartz penetrate the porphyry downward from the contact. The gold lies in a thin, flat sheet upon the igneous rock and under the slate and in some cases extends a short distance into the former formation, rarely into the latter. It is in the form of coarse and fine grains that have a peculiar smooth and rounded surface, quite unlike the free gold in quartz veins. An experienced California miner can readily distinguish an isolated particle of pocket gold from both placer and vein-quartz gold. There are rarely threads, but sometimes nuggets of considerable size are found. The miners say the gold has been melted and certainly in places it appears as though many of the grains had been partly liquefied and combined into large porous nuggets. I believe, however, that this is deceptive and that the deposits were formed in the presence of less heat than most gold deposits in bedrock.

In a paper on the 'Origin and Age of Certain Gold Pocket Deposits in Northern California', in the July, 1899, number of the *American Geologist* I advanced a theory in regard to the origin of these gold pockets, of which theory I then said I had a monopoly. So far as I know, I have continued in the enjoyment of this monopoly, but I now wish to repudiate the theory. I had recently returned from the Isthmus of Panama, where I had been impressed by the concentration of gold into hollows of the soft bedrock on a certain seashore, and I conceived the idea that these northern California pocket deposits had been concentrated by wave action into hollows of the surface of the igneous rock at the time the sea was advancing to lay down the Bragdon formation. The hypothesis was favored by the fact that there was an erosion interval between the deposition of the two formations. The Clear Creek volcanic series is older than certain Devonian limestones in the Kennett region, and the Bragdon formation is younger than these limestones. In short, the volcanic series was planed down by subaerial erosion before the sea advanced and deposited the Bragdon sediments on it. There is nothing impossible in the theory advanced eleven years ago, but now I have a better explanation, one which I think accords well with all the known facts. I came in time to realize that the pockets are nearly always found in the vicinity of mineralized shear-zones in the altered volcanic rock, that may have furnished the gold. In the *Mineral Wealth of Northern California* of January 15, 1901, in a paper entitled 'Pyritic Veins of Northern California', I described several groups of pyrite-impregnated shear-zones that occur in what I called the Clear Creek greenstone, the Abrams mica schist, the Trinity serpentine and the Salmon hornblende schist. I was too optimistic about the future of mining operations on these veins in general, for I was led into a misconception of their true gold content. In those days I placed too much confidence in the reliability of the average country assayer, and I was led astray by the assay certificates shown me by the owners of many of the "large low-grade base ledges." However, some gold is probably present in all of them, and ranges between a strong trace and $1 per ton.

For the purpose of this paper I wish to call particular attention only to the mineralized shear-zones in the Clear Creek volcanic series. They are found throughout its extent, but are best developed in certain limited districts where they are from 5 to 200 ft. wide, averaging between 20 and 30. They are usually quite regular in outline and traceable commonly from 1000 ft. to a mile. The outcrop has a schistose structure and is heavily stained with iron oxide resulting from the decomposition of pyrite. Below the zone of oxidation, the rock is a white or light greenish aggregate of quartz and sericite mainly, impregnated with small cubes of iron pyrite or in places containing irregular bunches of coarsely crystallized pyrite. The same system of base veins passes eastward into the copper-bearing veins of the Iron Mountain and Copper City districts, but in the Trinity Mountain region there is not much copper present.

Usually there is no free gold found in connection with these veins, not even in the oxidized portion or in the loose dirt below the outcrop, but careful assays show the presence of a small amount of gold and silver. This may run up to $2 or $3 per ton in places, but 50c. might be a fair estimate of the average gold content of the entire group. This gold is probably in an exceedingly finely divided condition. It was deposited by heated solutions that ascended along the shear-zones from great depths and partly replaced the schistose country-rock with sulphides.

I believe that some of this finely divided gold passes into solution in the zone of oxidation and is leached out by the descending meteoric waters. These waters make their way through small crevices and porous zones in the altered volcanic rock and slates until they escape into the streams. Much of the gold in solution probably is carried away by the streams, some may be deposited in cracks in the rock to form the so-called 'pocket seams' that have been such a prolific source of placer gold in the region between the Sacramento and Trinity rivers, and the remainder goes into the 'pockets'. The reason that the slate-volcanic rock contact is the great 'pocket' horizon is, that it is there that the gold-bearing solution first reaches a carbonaceous rock—the carbon precipitates the gold. The water may reach the contact by traveling nearly horizontally through inclined strata or by ascending under hydrostatic pressure. The sheared slate so frequently found along the contact aids in holding the solution to it while the gold is being deposited. Probably, also, water issuing from the slate carries the precipitating agent. For a long time the point of union between the precipitant and the gold-bearing water remains at one place at or near the contact and thousands of dollars' worth of gold is thrown down with a space of a few cubic yards or less. This certainly is secondary concentration by meteoric waters circulating near the surface, though it is not secondary enrichment in the sense ordinarily meant. I have supposed that the limonite found in the pockets has been derived by oxidation of pyrite which was deposited wtih the gold, but I am not certain. Pyrite has been deposited in northern California in comparatively shallow stream deposits and on the surface of glaciated serpentine boulders buried in till, so there would be nothing unusual about its deposition by meteoric waters in the gold pocket deposits. It is important to know whether the limonite has been deposited as such or has been produced by oxidation of pyrite. In the former case it would demonstrate that the gold pockets are strictly sub-surface phenomena, as they appear to be. Sometimes, when one is exhausted, a thin gold-bearing thread or seam leads to another, but they are never found far beneath the present surface. However, whether deposited in the zone of oxidation or just below it, I am pretty confident that the gold is derived from the mineralized shear-zones in the volcanic series and is transported in solution in ordinary cold meteoric waters circulating within several hundred feet of the surface of the earth.

Amalgamation in the Drum Lummon mill of the Montana Gold Mining Co. at Marysville, Montana, showed by a series of experiments that silver in the ore was amalgamated on the plate with difficulty. The finest, that is, highest-grade gold, was always recovered nearest the lip of the mortar, an increasingly greater percentage of silver being amalgamated as distance from the battery increased. Millmen usually clean up the entire surface of the plates, placing the amalgam all in a single pan or granite kettle, giving no attention to the varying grade of gold on different parts of the plate. A few experiments in this direction are advisable in any plate mill. They may lead to interesting and valuable results.

At the Kimberley and De Beers diamond mines in South Africa, the diamond-bearing earth when hoisted from the mines is trammed in trains of cars to a level field covering several square miles. There the 'blue' ground is spread out and exposed to sunshine and rain for a period of about four years, which permits the earth to disintegrate so that when it is put through the mills the separation of the diamonds will be as complete as possible. After crushing, the pulp is passed through concentrating machines and the concentrate run over inclined boards covered with a thick coating of grease. Strange as it may seem, only the diamonds adhere to the grease, all of the other stones of whatever kind passing over into the tailing.

THE MARCUS ELIPSOGRAPH

On the opposite page are working drawings for constructing an elipsograph designed by H. D. Hannah of the mining engineering corps of the Cananea Consolidated Copper Co., and published by his permission. The device is not patented and is offered freely to his fellow engineers by Mr. Hannah. It is based on the principle that one-fourth the difference of the two axes will describe a circle about the centre. A model was made at Cananea and proved satisfactory in practice. The machine is perhaps made sufficiently plain by the drawings. Fig. 3 is a detailed cross-section of the pieces shown in Fig. 2.

Fig. 1.

Fig. 2.

Fig. 3.

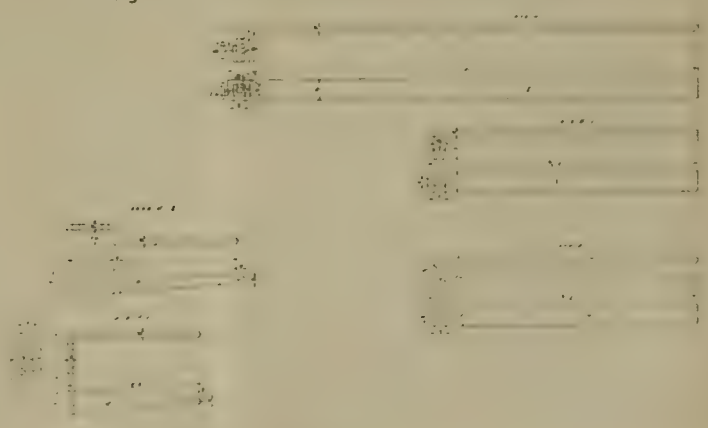


Fig. 4.

The Marcus Elipsograph.

Compensation for Industrial Accidents

By David Ross

The American Mining Congress, at its late session at Los Angeles, California, adopted a resolution which clearly commits that body to the principle of legislation favoring definite compensation in the case of industrial accidents. This is a marked forward step and is the more significant when the fact is recalled that a large portion of the delegates represented employers of labor whose co-operation is essential to secure such reform in our present law and practice. It not only attests the humanitarianism of the men who have their capital invested in legitimate mining, but also reflects their business ability. The movement has become an organized effort to substitute for the unjustifiable waste that now marks every attempt to adjudicate accident claims, a plan, inexpensive and easy of enforcement, that will place the responsibility on the whole industry and yet will consider fairly and treat equitably every interest. It is unfair to the employers that they should be made the subject of interminable legal assaults in which designing lawyers play upon the gambling instincts of injured men. It is no less unfair to thrust upon the injured man or his dependent family the entire burden of the loss sustained through accidents, a great per cent of which is the result of trade hazard for which neither employer nor employee should be held liable. The purpose of the resolution adopted at the Los Angeles meeting is to save the money now squandered in useless litigation, and give it, under proper regulations, to those employees who may be injured, as compensation in part at least, for suffering and loss of earning power. The compensation thus provided is to be recognized as a proper liability of the business and to be charged against it like all other legitimate costs. The wonder is that the American people with all their indomitable energy and enterprise have not been the leaders in this, the most important conservation movement. Instead, any one of twenty-one foreign governments might be accepted as a model. The United States is the only civilized nation that persists, in this respect, in its adherence to an outgrown, obsolete legal policy.

The legislature of Montana, at its last session, enacted a law, effective December 1 this year, authorizing the levying of a tax of one cent per ton on all coal mined and sold in that State, for the purpose of providing a fund from which to compensate those injured in connection with the coal mining industry. The New York legislature, upon the recommendation of its Commission on Employers' Liability, enacted two laws effective September 1 this year, one optional and the other providing compensation for accidents occurring in certain non-competitive industries. The Illinois commission which was created by act of the special session, 1910, partly on account of the awful disaster at Cherry, reports to the governor, C. S. Deneen, under date of September 15, the results of six months' investigation of the subject. Unfortunately, the members were unable to agree upon a measure. While the employers on the commission were favorable to a compensation act, certain of the labor representatives, though not opposing the plan for compensation, felt that it should follow and not precede a comprehensive employers' liability law. Because of this division of opinion the commission adjourned without recommending any particular bill. The failure is regretted, but it does not relieve the legislature about to meet the responsibility of squarely meeting the issue; in fact, the dominant political party pledged its candidates for the legislature to do so. The valuable data collected by the commission and incorporated in its report will prove of great service in the task of formulating a law on the subject. Several other States, notably, Wisconsin, Minnesota, Michigan, and Massachusetts, have commissions now engaged in the work of proposing changes in present employers' liability laws, the reports of which will be submitted for consideration this winter. The conclusions or recommendations of such commissions necessarily depend upon legislative approval to become effective. If accepted, certain selfish interests will probably attack the measure in the courts, thus postponing indefinitely the time when they become effective. Anticipating the ultimate enactment of laws requiring compensation in all cases where employees are disabled, would it not be advisable for associations of employers in conjunction with their employees, to put into immediate operation by voluntary agreement a plan that would fully dispose of the legal contentions resulting from industrial accidents?

After a trial of more than half a century, the present system of litigation growing out of personal-injury claims, founded on statutory or the common-law theory of negligence, judged by its results, has failed. Whatever justification the principle may have had in the earlier and simpler stages of our industrial evolution, any further attempt to apply it to the complicated conditions of the present day must be attended with greatly increased embarrassment to the courts by taking up their time to the exclusion or delay of more legitimate business. In addition, there will be denial of simple justice to injured workmen or their dependants, and ever-increasing annoyance and expense to employers who in many instances are compelled in self-protection to contest the suits. Employers are familiar from experience with the defenses interposed against claims of this nature, so that it is unnecessary to discuss the rules of contributory negligence, assumed risk, the relation of fellow servant, and other doctrines proclaimed from time to time by the courts. They are also familiar with insurance organizations which in consideration of a fee, that is never earned or is dissipated in expenses that should never be incurred, agree to relieve them in part from the legal consequences of an accident for which an uninformed jury may hold them responsible. The situation created by our failure to give even-handed justice, has made it seemingly obligatory on the part of many

to seek protection in the nature of liability insurance. That too has miserably failed. This is true first, because the protection is incomplete; second because real responsibility cannot be permanently and successfully transferred; third, because the injection of a foreign interest, usually without conscience and with no particular concern for the rights or interests of employees, intensifies friction and widens the gulf between employers and employees; and fourth, because the plan is organized for private or corporate profit, is maintained at great expense and constitutes a severe tax upon the industry, only the smallest fraction of which finds its way into the homes of injured workmen. This plan, like the legal practice under which it has been developed, now stands condemned, and the task of the moment is the substitution of a system that will remove on the one hand the requirement for a suit in the civil courts, and on the other the necessity of depending for protection upon insurance companies as at present organized.

The only proposition to consider is that of substituting for the present expensive and wasteful plan, the policy of compensation under which the victims of industrial accidents would receive in the case of all injuries a definite sum equal under many existing laws, to one-half wages during incapacity, and for fatal accidents, in the case of the head of a family, the aggregate of three years' average earnings. There is nothing new or revolutionary in such a scheme. It has long been the settled policy of more than a score of foreign governments, some of them adopting it over a quarter of a century ago. The policy is based on the sound economic theory that the losses sustained by workmen from accidents received in the line of their employment form a legitimate tax upon the industry responsible for them, and that the earning power suspended or lost in consequence should, in part at least, be recouped out of the profits of the enterprise and charged against the business in the same manner as are breakages, depreciation of plants, and other unavoidable costs of production.

Mining operators may have been deterred from adopting a compensation plan under the impression that the vanishing margin which unlimited competition has left in the way of profits in many cases, makes it impossible. This conclusion may have been formed without fully considering the expense of present methods. A prominent manufacturer in Illinois, for his own information, recently checked up his casualty accounts for a period of nineteen months. Somewhat to his surprise, he discovered that the amount required to compensate all his employees who were injured during that time (on the basis of the English compensation law) comprised but one-fifth of the premiums he had paid for accident insurance during that time. The aggregate value of the total coal product of Illinois for 1909 was over $50,000,000; that for the entire country being $615,000,000. The addition of nine-tenths of 1% to the estimated sale price would be sufficient to allow the payment of one-half wages to every mine worker for time lost on account of injury and $2000 to the families of all those who were killed during that year, and yet competition is nowhere as keen in mining as in coal production. Because of certain laws employers are not yet in a position to protect themselves against the inexcusable waste incident to our whole competitive system but present restrictions need not prevent the inauguration of a policy in relation to accidents, such as that herein suggested which, while the cost might be as great or greater than at present, would carry with it the comfort and satisfaction that whatever sums were paid out on such account, would go directly, and what is equally important, *immediately*, to those who are most entitled to receive them.

The practice and the law should unite with ethics in requiring that the financial loss caused by injury to a workman should not be imposed upon him alone, but shared as far as can be, by the society receiving benefits from his labor. Certain employers contend that to provide compensation for accidents would operate as a direct inducement to carelessness, and that instead of less there would be more casualties. Fortunately, such an opinion among employers is rare, and it is enough to say that the experience of foreign countries, working under compensation laws, shows without exception that the accident rate has been reduced. In the matter of industrial accidents the purely legal question as to where the personal responsibility rests should not be considered at all. It is not, strictly speaking, a personal affair for the reason that in extra-hazardous occupations, like that of railroading and construction work, coal and metal mining, accidents occur chiefly as a result of the inherent dangers of the calling, making it impossible in most cases to determine the question of negligence as defined by the law. Our difficulties in these respects are but multiplied in the foolish attempts to apply a legal theory that can have no logical or reasonable relation to the existing industrial situation or to our new social concepts of the real duties and responsibilities of men. A capable and distinguished judge, having a long and varied experience in the trial of personal injury suits, declares he could write in ten minutes a fair and comprehensive law on the subject of employers' liability. It should be a simple act comprising a few lines requiring evidence of the fact that an injury had been sustained by a workman while in the course of his employment, and the earning time lost on that account. These few words clearly define the basis upon which accident claims should be adjusted; the balance is merely detail. Eliminating the disturbing issue of negligence, there would be no longer a basis for quarreling over whether the employer be liable or not. The only question likely to give rise to a difference of opinion is in partial disability cases, in which the degree of injury has to be determined, and the time of the courts need not be occupied in such hearings, as those matters may be adjusted by commissions organized for that purpose.

Some confusion exists in the minds of workingmen regarding liability and compensation laws. This is shown in the attitude of certain labor lead-

ers who oppose all plans proposing compensation until a comprehensive employers' liability law is enacted. A law providing compensation for injuries is a distinct liability law without the uncertainties that inevitably attach themselves to any proceeding under a general liability act. Every statute attempting to define employers' liability is essentially based on the legal idea of negligence. Wholly aside from the particular defenses which the rulings of the courts allow, there can be be no recovery, under a general liability act, except on proof of negligence on the part of the employer. Under such a procedure, with any kind of a law, the burden of furnishing evidence in support of the charge of negligence, is upon the one seeking to recover damages. There can be no escape from this obligation on the plaintiff's part, and the record of litigated cases shows only too frequently how lamentable has been the failure to supply the needed evidence, and this, too, in cases where neither the doctrine of fellow-servant, contributory negligence, or assumption of risk had been pleaded or allowed in defense.

While in a few cases under the general law judgments have been recovered and sustained for considerable sums of money in damage suits, the amount of the judgment recovered in the average case is scarcely equal to the expense required to defend it. After a careful investigation, S. C. Kingsley, of the National Conference of Charities, discovered that in fifty contested cases, where the claimants were successful in dodging every legal technicality, the aggregate amount recovered was $8749, or an average of $174 for each. In the case of the Cherry disaster, the adjudication of the claims was founded on the English Compensation Act, and fifty families received an aggregate of $90,000, or an average of $1800 each. If the real concern is for the welfare of the families of injured workmen, surely there can be no reason for hesitation in the matter of a choice between the two systems. One offers a definite amount paid directly without the expense or intervention of agents or attorneys; the other presents the skeleton of a hope—the prospect only of a long-delayed lawsuit with the final result always uncertain.

The hoped-for millennium is still far off. Society is still forced to deal with men and situations as they are, not as wished, and in legal contests with rich and powerful interests the injured workman, represented by a contingent-fee lawyer, finds himself at a disadvantage when pitted against the trained corporation attorney. In no other way can the increasing number of verdicts for the defendant be explained. It is incredible to suppose that the workman who performs all the labor, assumes all the risks, and suffers all the pain will consent to a further continuance of an unequal contest.

The number of mining accidents in coal and metal mines is quite evenly distributed, those of a fatal character exceeding three in every thousand employees in each class of mines. Public attention, however, has been directed chiefly to accidents in coal mines on account of recent frightful disasters in some of which more than half a thousand lives have been lost at one time. The great loss of life in the mines of West Virginia, Ohio, Pennsylvania, Illinois, and Colorado within a period of two years, with a proportionate loss in our metal mines, although not so extensively advertised, imperatively demands that everything possible be done to diminish the number of accidents and to care for their victims in a humane and businesslike manner.

Every calamity brings in some form its compensation. These terrible experiences may have been required to arouse in men a true sense of their responsibility to their less fortunate fellows. The devastating floods that destroyed the city of Galveston ten years ago made necessary the commission form of government for cities, a system which, beginning with that wrecked municipality, is now spreading over the country and offers hope of escape from the blight of municipal corruption. If out of the wreck of industrial accidents, the result of inevitable dangers, there shall come reasonable laws recognizing in a broader way the rights and interests of all men, some recompense will have been made and the lives of our workers shall not have been offered in vain.

MINE DRAINAGE

In wet mines water occurring in the upper levels may be prevented from descending to the lower part of the mine by building low dams about the stations and conducting the water to a tank beneath the level. Sometimes, when water falls so abundantly in a vertical shaft as to make passage through it very disagreeable, this trouble may be averted to a great extent by clearing all débris from the plates, and tacking on to the edge next the compartment, thin strips of lath, or on top of the plates next to the edge, strips of molding one-half to three-quarter inch high. These extend entirely around the shaft, and are placed on as many sets of plates as necessary. The result is to turn the water to the back of the plate where it runs down on the lagging, almost entirely obviating the dripping water into the open compartment. At the several levels, dams may be constructed, as suggested above, to keep the water coming in above one level from descending to the next below. The water accumulating in the tanks beneath the levels may be removed by pumping or by bailing. If by the latter means, a pipe of liberal size is laid from near the bottom of the tank to the shaft, where is arranged a gate-valve and hose, the latter being fitted with an arrangement to hang the lower end on a hook, above the level of the valve and out of the way. When it is desired to load a skip, the skip is lowered to a point just below the valve, the valve is then opened and the water pours into the skip. When full, the skip tender shuts off the valve, hangs the hose on the hook, and rings the skip away, the operation being repeated until the tank is empty when the same thing is repeated at another drainage level.

Good extraction from ores can be expected only when both machinery and process are adapted to the ore under treatment.

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of mining and allied matters pertaining to mining and metallurgy. The editor welcomes the expression of views contrary to his own, believing that careful criticism is always valuable and a compliment. Insertion of any communication is determined by its probable interest to the readers of this journal.

Oil Land Legislation

The Editor:

Sir—In view of the action of the Mining Congress at Los Angeles in the matter of the location of oil placer claims, I have hoped that some of your eminent contributors would have given their views on the subject, for it is, to many mining men, a very important matter, and I should have much preferred that an abler pen than mine had brought up the subject. As I understand it, the status of an oil-placer location is just this, that anyone (a citizen) may make a location, but until oil is found, the locator has *absolutely no title* to the land. In other words, the location gives him practically no right whatever, for even if he is drilling, a second or third party may do the same thing on the same 20 acres, or 160 acres, as the case may be, and the first to strike oil can take the location regardless of the priority of location. This is, I am assured by excellent legal authority, the status of an oil-placer location; although the same authority stated that an intruder *might* be enjoined by law; also, that he, and others of the legal profession, doubted whether the courts would uphold such a ruling. This means that to make a location means a lawsuit. Again, I believe there is also a ruling, or resolution of Congress (I write under correction) to the effect that each of the associated eight locators (*bona fide*) of a 160-acre tract must develop his holdings. This ruling or resolution seems to me to have been made without due consideration, for while it is true that eight persons are the *minimum* that can locate 160 acres, there is no limit to the *maximum*. In the case of oil especially, the expense of well-boring is very great, and a greater number of persons can, and usually do, associate themselves together to bore for oil than would be the case in gold placers.

Let us suppose, for the sake of illustration, that 1000 persons associate themselves to acquire an oil claim and bore for oil, and that they agree to share the expense equally; also, that they either go in a body or send a committee of eight, to locate 160 acres of land, the name of each one appearing on the location notice. Now, the point is, that they—the 1000—are all *original locators*, and under the ruling *each* must develop his holding. As each one would have a one-thousandth part of 160 acres he would be entitled to 160 : 1000 = 0.16 of an acre, and as there are 43,560 sq. ft. in one square acre, each would have 6969.6 sq. ft.: as $\sqrt{6969.6} = 83.48$, each would have a piece of ground 83.48 ft. square. Now, it may be, and is, possible to drill a well on a piece of ground that size, if only one well is to be bored; but it is wellnigh impossible when 999 persons are doing the same thing at the same time on each 83.48 ft. square of ground; and if you increase the number to 2000 or 3000 associates, it becomes wholly impossible. No law or ruling can oblige a man to do the impossible.

The consensus of opinion at the Mining Congress was that fair laws should be enacted to protect the locator and give him a reasonable length of time in which to find oil. Is it not time that the men interested in mining and oil come to some definite agreement as to what is proper and fair to all, and then, knowing what they want, demand such legislation as is necessary? There can hardly be two opinions, one would think, as to the absolute fairness of giving the locator a reasonable length of time—say three years—in which to prove whether he has oil or not. It is such rulings as the above that are turning public opinion against conservation, for such methods of conservation, and the advocating of the lease system, tend to conserve the natural resources of the country for the moneyed power, for the rich can buy, and they can pay royalties.

I should like to see this question discussed in your columns, and hope that it may lead to united action by the mining fraternity. It is also a question of practical and intelligent legislation, and one in which mining men especially should take a leading part. It may be thought that I am straining the point by using 1000 persons as an illustration, but even that number is not unknown in adventures of various kinds, and I believe is not unknown in mining ventures. An association need not incorporate, and many a mining company has more than 1000 shareholders. However, my object is to show the state of chaos into which we have drifted, and to try to find a way out.

CHAS. R. GENT.

Trimmer, California, November 23.

A Cyanide Problem

The Editor:

Sir—A statement of the principles embodied in Designolli's process for treating gold ores containing antimony may assist in suggesting a solution to the 'Cyanide Problem'. Briefly, the process consists in crushing ore, or treating the ore with a solution of bichloride of mercury and sodium chloride, and for its basis rests upon the facts that when an acid solution of any salt of mercury is exposed to the action of an electric current the salt will be decomposed and metallic mercury deposited on the cathode, and when the cathode is gold, will result in amalgamation. When clean iron surfaces are in contact with a salt of mercury, in a weak acid solution, on touching them with gold the salt of mercury is decomposed, the metallic mercury thereupon amalgamating with the gold. And, that chlorine has a great affinity for antimony.

In operation, the antimony compound is decomposed, the antimony uniting with the chlorine, while the gold combines with the metallic mercury.

LEE FRASER.

Punta Arenas, Costa Rica, October 15.

Note: Commercial bichloride of mercury, or corrosive sublimate, costs 90c. to $1 per lb., and sodium chloride, or commercially, common salt, costs 2 to 4c. per pound.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

No patented mining claim in Nevada, nor any other State, is subject to re-location, no matter how long idle.

Straightway valves that leak may sometimes be repaired by turning the disc which forms the valve, presenting a new face to the valve seat.

Placer deposits may be prospected satisfactorily by means of a well-boring outfit. It requires experience, however, to secure reliable results by this method, as well as by any other.

Mercury fulminate is never used commercially as a blasting agent on account of its prohibitive price and the extreme danger incident to its handling. It is handled in small amounts, and then only with the greatest care.

A reinforced concrete standpipe 50 ft. diam., 106 ft. high from the inside of the bottom of the tank to the top of the cornice, and with a capacity of 1,500,000 gal. has been completed and is in service in the water works system of Attleboro, Massachusetts.

The maximum width for reverberatory furnaces has been determined by long experience, to do the best work, as 14 to 16 ft. The length may vary from 40 to 116 ft. Greater length than the latter has not been found to afford any additional capacity or economy.

Both Livingstone and Stanley tell of the natives of the Upper Congo and Arruwimmi rivers, in equatorial Africa, shooting lumps of rich copper ore from muskets. This ore has been found abundant in Congo Free State, particularly in the southern part, in the Katanga region.

The cost of shaft-sinking per foot varies greatly, according to size and shape of the opening, and with the character of the rock. The shaft sunk in soft ground is not always the least expensive, for soft wet ground often entails expense that is wholly unnecessary in hard-rock shafts.

A mineral deposit need not of necessity be a 'true fissure vein' to be either extensive or valuable. Some orebodies, the result of impregnation, are worth millions of dollars and are sufficiently extensive to satisfy the most exacting. The Homestake gold mines, the lead-silver deposits of the Coeur d'Alene, the Copper Queen and United Verde of Arizona, are types of ore deposits which are not fissure veins.

Gas engines have been found very useful and generally satisfactory in the southwest mining regions, but although this type of motive power is excellent, the engines require a man of experience to operate them. A novice sometimes fails to get good results from the best engines made and may ruin one in his bungling attempts to remedy a difficulty the nature of which he does not understand.

The largest single mass of solid gold ever discovered in California was taken many years ago from the Bonanza mine at Sonora, in Tuolumne county. It was worth $40,000 and was accompanied by very rich quartz worth all told $320,000 more, the entire pocket containing $360,000. This mine produced more than $2,000,000, the greater part of which was pounded out of the rock in hand mortars. In later years a 2-stamp mill was built on this noted and peculiar mine.

The rock dacite, so frequently referred to in the literature descriptive of the mines at Goldfield, Tonopah, and elsewhere in Nevada, is a quartz-bearing andesite. The rock is usually gray in color, sometimes red or buff colored, due to presence of iron oxide; is rough to the touch, but may be so thoroughly altered by percolating mineral solutions as to be difficult of identification. It may be thus rendered hard and dense by infiltration of silica, or soft and white by kaolinization of feldspars.

Sulphides of the mines of the Mother Lode of California vary greatly in value—from about $20 to $150 per ton, the average probably being about $40. Some of the fissure veins produce sulphides worth over $100 per ton, when in a rich ore-shoot. Large masses—zones of mineralization rather than fissures—usually carry lower grade sulphides. There are exceptions to this, however, for the Zeila mine at Jackson, Amador county, produces high-grade sulphides, though the ore contains relatively little free gold. At the Golden Gate mine, near Sonora, the gold was found almost wholly in the sulphide mineral, principally pyrite.

For making mine ladders none but good lumber should be selected. Make them with 12 in. between the sides and have the steps not over 8 in. apart. When the distance from the top of one step to the top of the next is more than 12 in. climbing becomes laborious. Men can climb much farther in safety when the ladders are of proper construction. Ladders should never be placed vertically in a shaft where it can be avoided. Give them a slope, with landings every 15 ft. If this be not practicable, place a plank at every 40 to 50 ft., at a sufficient distance from the ladder to permit men to pass readily, but where they may rest if necessary.

At hydraulic mines the streams of water are ordinarily used under a head varying from 150 to 300 ft. A much heavier pressure is extremely dangerous. Under all high pressures the nozzle or giant, as it is called, is securely anchored. A stream under 300 ft. head would instantly kill a man should he be so unfortunate as to be struck by the solid portion of it. Nozzles for hydraulicking vary in diameter from 2 to 10 in.—6 or 7 in. being the most common. These nozzles vary somewhat in form, the most of which variations are patented, the object of the several types being to prevent spraying of the stream.

Special Correspondence

PANAMA

Members of the American Institute of Mining Engineers Inspect the West Locks and Working Methods on the Canal

The working day on the Isthmus is 8 hours long. It is divided into two parts, namely, from 7 to 12 in the morning and from 1 to 5 in the afternoon, thus avoiding the extreme midday heat. In order therefore to get the actual working operations it is necessary to make an early start and consequently the special train at the service of the Institute party left the station a few hundred yards from the hotel at 8 o'clock every morning. All of the remaining hours of the days spent in the Canal Zone were needed in order to carry out the program. The Isthmus of Panama has a reputation for rain during its rainy season and on November 4 when a more than usual amount of tramping had to be done it made a strenuous effort to maintain its reputation. While this somewhat added to the discomfort of the day, it was fortunate in that it gave better opportunity to observe how the work was kept going in spite of difficulties. In any other place work would be suspended, here the workmen simply wade in mud and water knee or waist deep, and pay no more attention to the rain than if it were so much perspiration. It has to be a flood to cause even a temporary suspension during working hours.

The first visit of the day was to the unfinished locks at Miraflores and Pedro Miguel, the steps by which the canal is elevated from tidewater at the Pacific end of the canal to the main channel. With wet clothes and muddy feet, the party walked through the locks and marveled at the bigness of the thing, the completeness of the organization, and the unexcelled character of the workmanship. What ever one's opinion may be in regard to the wisdom of the building of the canal, no intelligent, unprejudiced observer will say that Uncle Sam's money is being wastefully expended in this the greatest engineering work ever projected. In every foot from Colon to Panama it reflects the genius and the power of the man in control, Colonel Goethals, a man modest and quick in manner, genial and good fellow-like in disposition, strong in organization, in command in details, and in executive management.

After the inspection of the locks, the visitors were taken to the pumping station on the flats of the Rio Grande, and to the portion of the canal where California hydraulic mining methods are applied to the excavation work. Two giant nozzles wash down the easily disintegrated sediment and the mud is pumped through 16-in. pipes to a settling pond off the right of way. The method is cheap and expeditious. The morning trip was completed by a visit to the electric-power plant where is developed the energy used in the operation of the hoists and other machinery employed in the construction of the locks. This plant will be permanent, as from it will be taken the power to operate the locks and the electric locomotives to be used to tow vessels into and through the locks. No steamer will be allowed to pass the locks under its own power. The afternoon was occupied by a trip in tugs to the Pacific entrance of the canal. Here excellent opportunity was given to observe two distinct methods of subaqueous excavation. One dredge fitted with air-drill apparatus is boring holes in the submerged rock which is then broken up by dynamite. The other is fitted with a Lobnitz rock breaker, consisting of a solid steel shaft about 50 ft. in length and weighing 10 tons, which is raised 15 or 20 ft. and allowed to drop of its own weight on the rock. It operates through a well in the centre of the dredge. Exact figures as to the relative cost of excavation by the two methods are not at present available, but it is hoped that by the time the work is completed reliable comparisons may be made. On the way back from the water trip the party stopped at the quarry on the side of Ancon hill where rock is being quarried and broken for making the concrete used in the construction of the locks. The rock is rhyolite, and [illegible] material for the purpose could be [illegible] The quarrying and crushing of the rock are conducted on a large scale in keeping with other work on the canal. The side of the hill being taken down at [illegible] level and by the time the canal is completed a [illegible] area of Ancon hill will have been taken away. No [illegible] and stone is obtained or desired and the quarries [illegible] are accordingly not difficult being simply [illegible] blasting and loading. The rock is hauled in cars to the breaker on the side of the hill below the quarry where a car at a time is dumped directly into a track [illegible] from which it passes to four jaw crushers. Thence by gravity to revolving screens and thence to the railroad cars.

The first session of the Institute in the Canal Zone and the fifth of the meeting was held in the evening in the social room of the Tivoli hotel at Ancon. The first speaker of the evening was Colonel Gorgas, chief of the sanitary department who gave an interesting account of the fight against the yellow fever mosquito the attacks of dysentery and the threatened invasion of the plague which had broken out at La Boca, one of the island resorts on the bay and the place where the French engineers had built their hospital. No greater victory over disease has ever been accomplished than that won by Dr Gorgas and his staff. Dysentery has practically disappeared, the plague got no lodgment, and there has been no yellow fever on the Isthmus in three years. It is one of the most healthful spots on the globe, and, as here eternal vigilance is the price of health, no let up is allowed in the exercise of precautionary and preventive measures. The stream beds are kept free of flow retarding weeds and grasses, crude petroleum is kept automatically fed upon the ponds and pools, and disinfectants are being constantly applied to every spot where disease germs may propagate.

C. W. Hayes, of the U. S. Geological Survey, who arrived unexpectedly from Washington at noon this day, for the purpose of making some geological studies of the Isthmus from the exposures made by the excavations, gave a brief account of the general geologic structure of the region, though, he explained, as he had only been on the Isthmus 14 hours, he had not been able to make any detailed study. The session closed with a description by Gardiner F. Williams, with lantern-slide illustrations, of diamond mining at Kimberly and gold mining on the Rand.

Saturday was excursion day without business. The excursion was to the island and old, very old, settlement of La Boca, and was made on tugs furnished by the Commission. The weather fortunately was ideal and the day highly enjoyable. Many took advantage of the excellent beach, a few hundred yards from the hospital building, for taking a dip in the waters of the Pacific. All were glad of the 'respite and nepenthe' from the sight-seeing tours, particularly as the evening was to be spent in dancing, this diversion having been arranged by the management for the younger members of the party and for the members of the Tivoli Club, the social organization among the officers and officials of the Canal Zone citizens. November 6, being Sunday, was also a day of rest, but the majority of the tourists accepted the invitation extended to visit the hospital to see how the sick and injured were cared for. In the evening a session of the Institute was held in the social room of the hotel. Edward W. Parker, of the U. S. Geological Survey, presented an abstract, illustrated by lantern slides, of his paper on 'Recent Developments in the Undercutting of Coal by Machinery.' The paper in full was printed in pamphlet form and distributed to those present. It has also been published in the November Bulletin. Mr. Parker was followed by David B. Rushmore, who showed some interesting lantern slide views of electrical machinery and of the application of electricity to mining and other industries and to domestic use in heating, lighting, and cooking. Gardiner F. Williams closed the session with some beautiful and entertaining views of South African scenery and of the big game so plentiful in that part of the globe. All day of Monday, November 7, was

given up to a visit to the dam and locks at Gatun on the Atlantic side of the Isthmus. The usual good fortune that has marked the entire trip continued, for while there were numerous heavy showers, they almost without exception occurred while the party was under cover, and rain ceased while the inspection of the work of dam and lock construction was being made. This was one of the most, if not the most interesting and enlightening days of the meeting, and was a fitting culmination, for it left a profound and lasting impression upon each of the party. The work at Gatun is the keystone of the whole great enterprise. Every fair-minded, intelligent American citizen who visits the Zone must as a result of his visit be prouder of his citizenship and of the men doing the work. The evening was spent in preparation for an early start the next morning for Colon and the beginning of the homeward journey. At 8 o'clock Tuesday morning the special train which had been at the service of the party during the week of its stay left Panama for Colon, and promptly on schedule time the *Prinz August Wilhelm* cast off.

The seventh session of the meeting was held Wednesday afternoon in the dining saloon. It was devoted to a discussion of the Panama Canal, each speaker being allowed five minutes to give expression to the features that had impressed him most. The unanimity of opinion was remarkable. There was not a dissenting voice to the general feeling that if the Canal is to be built the present type is the one dictated by existing conditions. Equally unanimous was the feeling that the men in charge of the work were the men for the job, and eloquent tributes were paid Col. Goethals, Col. Gorgas, and their associates. It was recognized that but for the work of sanitation carried on by Col. Gorgas and his aids, the American enterprise would have suffered the same adversities and have come to the same disastrous end as did the French. The feeling of security against disease has had an important part in making effective the 'ginger' with which by example, more than by precept, Col. Goethals inoculates the entire force.

LONDON

Russian Copper Mine.—New Mine in Western Australia.— Copper in the Argentine.

Attention has been drawn in London recently to the operations of copper companies in various parts of the world, and it may be of interest to note the doings of some of them. I will start with the Spassky of Siberia, which after five years' hard struggle has now declared a dividend. This company was formed in 1904 to acquire the Spassky smelter, the Yuspenssky copper mine, and the Karagandy coal mines in the Akmolinsk district, Siberia. Reports were made by E. T. McCarthy and by Pellew-Harvey & Fell, and E. Nelson Fell was the first manager. He was succeeded by H. C. Woolmer two years ago. When additional capital was required in 1909, 50,000 new shares were guaranteed by L. Ehrlich & Co. and the Consolidated Gold Fields of South Africa. The copper deposit is notable for the richness of the veins. It has been difficult to set operations going in the past, owing chiefly to the distance of the copper mine, smelter, and coal mine from each other and from the Siberian railroad system. To give an idea of recent improvements, I may mention that in August 1909 the cost of copper production was £41 per ton. Since then the average has been only £29 per ton. At the Yuspenssky mine the main shaft has been sunk to 490 ft. and development at the 420 and 490-ft. levels are highly satisfactory. No decision has yet been arrived at as to the best method of treating the great quantities of lower-grade silicious ore in the mine. The amount of ore raised from the mine during May of this year was 2254 tons averaging 18% copper. Last month the first dividend was declared, at the rate of 12½%. Mr. Woolmer has recently done some prospecting on other parts of the company's extensive property, and this feature of the work will be gradually extended, for it is recognized that the surrounding country is highly mineralized and should repay exploration. The directors have also decided that the time has come when the company might use its established reputation in Russia for the furtherance of other mining schemes within the empire.——A new and promising copper mine has recently been opened up in the northern part of West Australia. This is the Whim Well, and it is in the West Pilbarra district, near the coast, east of Roeburne. H. R. Sleeman is general manager. During 1909, 6826 tons of ore was shipped averaging 15.3% copper, with a gross value of £65,273, and the net profit was £15,804. Out of this £20,729 was distributed as dividend, being at the rate of 15%. Since then the capital has been increased from £150,000 to £200,000, to provide funds for further development and for the installation of plant. The ore deposit is found in a flat lode which has been proved 3000 ft. along the outcrop, and for 2000 ft. it carries profitable ore. In the upper parts the ore is oxidized, and below, both by driving and by diamond-drilling, the deposit has been proved to contain sulphides high in sulphur and iron which will make a suitable smelting mixture with the oxide and carbonate. At the present time the best ore is picked and shipped to

Geological Map of Western Australia.

Europe in sailing vessels. Before deciding on the method of metallurgical treatment, full investigations are being made as to the characteristics of the various kinds and qualities of the ore, and further development will be made to prove the extent of the orebody. Another property belonging to the same company is a few miles distant, and is called the Mons Cupri. It is the intention of the directors to form a separate company to develop and finance this property. Taking it all round, the Whim Well company appears to have an encouraging future before it.—— The Famatina copper mine in the Argentine Republic near the Chile border has had, so far, an unfortunate history, but better times seem now to be at hand. The company, called the Famatina Development Corporation, was formed at the beginning of 1903. The progress has been slow, owing to successive managers either miscalculating the content and nature of the ore, or being incapacitated by the high altitude, 14,000 feet. The metallurgists who have reported on the method of treatment, among them T. C. Cloud, have been handicapped by want of knowledge of the resources of the mine. The directors have had much anxiety in connection with the financing of the company,

and from time to time issues have been made of various kinds of shares participating bonds and debentures. The financial results for 1909 were disastrous as a debit balance of $61,161 was left. The smelter was started in March 1909 but results showed that pyritic smelting was not satisfactory so heap roasting was adopted on trial. As the results in the blast furnace with roasted ore have been satisfactory it was decided to order a mechanical roaster. In addition another converter has been ordered. Hooper & Speak were appointed consulting engineers in July 1909 and S. J. Speak went to the mine in December. Subsequently Hooper Speak & Fielding were made general managers, and they appointed A. W. Jenks manager of the smelter and J. C. Vivian was made superintendent of the mine. The report on ore reserves by the late manager Mr. Powers, was not accepted by the consulting engineers because it was found that much rock and low grade ore had to be mined in addition to the best quality ore and they re-estimated the reserve at the Opalumkos workings at 119,300 tons averaging 2.7% copper, 10¼ dwt. gold, and 9.3 oz. silver, and at the San Pedro 60,800 tons averaging 7.3% copper, 4 dwt. gold, and 11½ oz. silver. With the recently improved method of smelting and the correctly estimated resources of ore, the company will in all probability be able to report profits in the near future.

NOME, ALASKA

Sluicing Stopped Early.—Output $3,500,000.—New Dredges.

The sluicing season for 1910 is rapidly drawing to a close as these notes are written late in October. All sluicing operations which depended upon the ditches for a water supply were closed on the first or second of this month, as a rapid fall in the temperature at that time formed slush ice in great quantities and made it necessary to close all intakes and open waste gates to hurriedly empty the ditches throughout the district. The cold snap broke again on October 5, and the weather conditions were favorable for sluicing until October 18, but the ditch proprietors anticipating freezing weather from day to day, were afraid to reopen their ditch systems. In the meantime many small operators, taking water either through short ditches or pipe or hose-lines, directly from the creeks upon which their claims are situated, and those using small pumping plants where the water is circulated from a dam or lake, continued to operate through another three weeks under conditions as favorable as any part of the season. All dredge operations were continued without hindrance from the short cold snap, and three of them, whose managers will stay in the district this winter, are still running at this date. Sixteen others have been closed and their running season shortened by many days on account of the early closing of navigation this season, and the desire of managers and other officials connected with their operations to catch the last boat for the outside. The output for this season has been curtailed by at least a quarter of a million dollars by the steamship companies arranging their last sailings so long before the weather conditions would have compelled the dredges to close. The production from Seward Peninsula for this season, as shown by the Customs Office on October 20, is $3,467,608, as compared with $4,070,290 for last year. There will probably be $100,000 more added to this by the dredges still running, and from other sources which had not been reported at the Customs Office on the date mentioned. The falling away of a half million in the output this year as compared with last is due in part to the exhaustion of certain well known pay-streaks and in part to an unusually late spring. The early part of the season was cold and wet, and last winter's frost held a grip on the creek and river beds some three weeks later than usual. Many of the dredges were hindered in their operations, and although this loss of time has been offset in some measure by a late fall, for the reasons already stated, the large operators have not been benefited by it. I will venture the prediction that this season's output is the smallest that will be credited to Seward Peninsula for a great many years. Ten new dredges have been built on the Peninsula this season, each having a capacity from 1200 to 2000 cu.yd. per day. Two others are under construction and at least five new ones will be started in next season. This will make a total of twenty-four dredges, twenty of which will be operated in the open water as soon as the frost will permit them to start in the spring.

TORONTO, CANADA

Activity at Porcupine. Cobalt Prospects Brighter. Lack of Transportation Retards Development.

Porcupine has of late been the great centre of attraction in mining affairs, and a rush is anticipated as soon as the winter roads are in condition for traffic. Though snow has fallen in the district there has not been sufficient frost as yet to give a firm foundation for the sleighing. In the meantime considerable quantities of machinery and camp supplies of all sorts are being shipped to Kelso on the Temiskaming & Northern Ontario railway to await the opportunity for transportation to the camp. There is every prospect of an active winter, as many properties have been sold recently at high figures to owners who are anxious to begin development without delay. Rapid progress is being made with the electric railway which will connect Porcupine with the railroad, but as construction work can not be carried on except at a great disadvantage during the cold weather it is hardly likely to be available before next season. The six Herlehy McPharland claims on lot 5, concessions 2 and 3, Tisdale township, about midway between

Cobalt, Ontario.

the Rea, or Connell Veteran, property and the Dome, have been sold by E. V. Perkins to a New York syndicate. Seven veins have been found on this property, one of which is 8 ft. wide and displays free gold. A large force will be put to work at once. The Temiskaming & Hudson Bay Mining Co., of Cobalt, has entered the Porcupine field and purchased the six Foster-Ellis claims in the northern part of Shaw township. Sinking will be started at once. The Consolidated Gold Fields of South Africa has lost no time in getting to work on the Rea property, and camp buildings are ready for a larger force. One shaft is down 36 ft., with a good showing of free gold all the way. A heavy winter's work has been mapped out. The Foster is awaiting supplies to start work on the sinking of two shafts, each 100 ft. deep, and 350 ft. from each other, to be connected by a drift. It has now a 30-ft. shaft on a wide quartz vein yielding free gold to that depth. The Dome has ordered a 40-stamp mill and will treat ore by double amalgamation, re-grinding, and cyaniding. The Timmins, which has a large body of ore blocked out, has contracted for a 30-stamp mill. The Bremner Veteran claim, comprising 160 acres, lot 9, concession 2, of Whitney township, has been purchased by a London banking firm identified with South African interests. It will be operated by a company chartered under the name of the Bremner-Porcupine Gold Mines Ltd. Charles Taylor, president of the Porcupine Gold Syndicating Co., of New York, a prominent Nevada operator, has bought the Freeland location adjoining one of the Armstrong-McGibbon groups. An English syndicate has taken over from A. S. Stewart the Carson-Hennessey-

Walker properties recently bought by him.——The position of some of the leading mines of Cobalt has considerably improved by reason of recent discoveries, especially at the La Rose, the value of the new vein on the main property being estimated at $2,500,000. At the Kerr Lake several veins of high-grade ore, running from 4 to 6 in. wide, have been cut in exploring the territory underlying the Lake. They are supposed to be continuations of the Crown Reserve veins. The Temiskaming & Hudson Bay, in driving at the 150-ft. level toward the Trethewey property, has struck a new vein from 2 to 4 in. wide., yielding 3000 oz. ore. The Wetlauffer is working in good ore below the 250-ft. level. A winze put down 22 ft. shows ore all the way down and a 6-in. vein at the bottom running about 300 oz. per ton. The Temiskaming has issued a highly satisfactory statement covering the nine months ended October 31, showing profits for that period of $597,364. It is taking out good ore at the 500 ft. level, though its best showing, so far, has been made at a depth of 400 ft. On the 175-ft. level of the Provincial an orebody 210 ft. long has been opened. The company will put in a small reduction plant. One of the largest shipments of bullion sent out by one mine left Cobalt this week, consisting of 44,125 oz. of silver bars consigned to London by the Crown Reserve.——The transportation difficulty is still hampering operations in the Elk Lake and Gowganda silver areas and mining is quiet. The Bartlett is being actively worked and is taking good ore from an open-cut and also driving on the 110-ft. level on a calcite vein. The Mann-Ryan of Gowganda is down 110 ft. and has struck a vein carrying good silver content in driving on the 85-ft. level. It has stored about $2500 worth of ore. The Montreal River Transportation Co., organized to serve the Elk Lake and Gowganda camp, has failed, owing to competition and lack of business.

ST. PETERSBURG, RUSSIA

Projected Russian Platinum Monopoly. — Perilous Prospects for the Platinum Trust.

The long-threatened direct intervention of the Russian Government in the platinum business is now definitely and formally announced as about to take place. The announcement states that the Minister of Trade and Industry has prepared a project of law, the effect of which will be to bring the entire platinum industry of Russia (and this, of course, means to within something under 5% of the entire platinum industry of the world) under the control of such a public body as may be constituted *ad hoc* by the Government with the approval of the Russian Duma. The project will be submitted to the Duma within a very short time. The story of Russian platinum is in some respects hard to understand, when one considers that the Russian Government has always been strong enough to have its own way in its own country when it so desired. The platinum deposits, as far as is known, are concentrated in the Urals and for a long time were exploited by one or two families who acquired very expensive habits and spent a large portion of their time enjoying life in Paris. The natural result was that as their tastes became more difficult to satisfy and more money was wanted, the platinum mines failed to supply the necessary means. Then the Western European financiers came on the scene and by a series of, shall we say, cleverly framed contracts got almost complete control of the situation in Russia. Then the monopolists, not content with the fine position they had attained, sought to make it stronger, and began a policy of market manipulation with practically no disguise in order to ruin the Russian producers and bring every element in the industry under their control. Finally the producers rebelled, held congresses, and appealed to the Government with such insistence as to compel the calling of an official conference to study what could be done to save Russia's practically only exclusive industry for the Russian people. After many drastic proposals had been considered, it is probably the most extreme project that has been adopted by the Government. To judge by the articles of the proposed law, it would appear as though the Government had decided to ride rough-shod over all the contracts that have been made with English and French houses respecting the supply and treatment of platinum. The chief articles run as follows:

1. To forbid the export abroad of unrefined (crude) platinum and to establish a period within which such prohibition shall take effect; always taking into account the time that will be necessary to enable the Russian official committee to erect a factory to treat all the Russian platinum. 2. To authorize the Minister of Trade and Industry to construct a platinum-smelting laboratory out of funds to be provided by the treasury, presuming that private enterprise shall prove unequal to the task of establishing such a laboratory. 3. To institute the issue of loans—by the Imperial Bank—on platinum, on the easiest possible terms for the producers, resembling the present system of loans on gold slime, and also to make loans to platinum producers in order to supply them with working expenses and further to encourage the provision of small credits to these firms; the regulations for governing the issue of these loans to be drawn up and executed by the council of the Imperial Bank. 4. To fix special rules for the sale, purchase, and storage of crude platinum, and also to simplify the control of the production and circulation of platinum. 5. That in the event of the law being passed containing the provisions of the first four heads, the necessary penalties shall be fixed to ensure their observance by all interested parties in Russia.

This proposition comes before the public at what might be called the psychological moment. The price of platinum today is higher than it ever was before, and perhaps it is just this period that is chosen, because the proposed law is more likely to find a favorable reception on the ground that a valuable industry will be kept for the country. It was at a similar period, some years ago, that the Russians woke up to the fact that, as they call it, foreigners were simply taking Russian wealth out of the soil and paying very little for it. It was then that one of the large mine owners took advantage of the failure of the French monopolist company to observe one of the clauses of the contract, to void it. Strenuous efforts were made to reconstitute the contract; but the Russians, thinking they had the ball at their feet, declined to be accommodating. The next step taken by the foreigner was to run the market down, which was done with such effect as to bring the Russian platinum industry into a state of ruin. It was when the producers had reached this unhappy position that they made their persistent and effective appeal to the Government which has had the effect described above. There can be little doubt that, matters having gone so far, the law will go through. But in event of the project becoming law, it is likely that serious international trouble may arise similar to what is threatened between Germany and the United States at the present moment. It is known, for example, that the enactment of the new German potash law on the top of contracts previously made between German potash mine owners and American contractors has set the two governments by the ears. Should, as appears almost certain, the new Russian Government project become law, the Russian Government will find itself in identically the same position toward the European monopolists as the German Government finds itself toward the American contractors for the output of the Aschersleben and other potash mines in the German Empire. Contracts exist which bind the largest Russian platinum owners to furnish the European monopolistic combine with their total output for many years, on terms which, unfortunately for the Russians, are particularly favorable to the Anglo-Franco-German combination. What the Russian Government will do to conciliate these live monopolists, with good binding contracts in their hands, in face of the position to be assumed by the new Russian platinum governing committee, cannot well be imagined. It is by no means likely that the outsiders will forego the advantages of their contracts. Perhaps a way will be found by enabling the European monopolists to come in under the protection of the new law and erect a factory in Russia for refining all Russian

platinum. This the French company had already offered to do before the project took shape. Should this be the way out of what will obviously be a most delicate situation, it is hard to see how the Russian producer is going to benefit. As far as he is concerned it will simply mean that he will be bossed from St. Petersburg instead of Paris.

NEW YORK

Activity of Postal Officials.—Market Conditions Unsatisfactory.—Talk of Copper Merger.—Calumet & Hecla.—Comment on Mines.

Activity by the postal authorities has been evidenced the past week by the raiding of some of the fraudulent concerns which have been vending alleged mining and oil stocks. A plan to reorganize the Ely Central and collect 25 cents per share in the process was halted by the postoffice department as fraudulent. A large number of illegitimate concerns which grew up during or since the Nevada mining boom have been halted effectively, for the first time.——The market situation generally is still unsatisfactory. The political victory of the forces allied against Mr. Roosevelt, for whose defeat Wall Street was avowedly working, does not seem to have brought any part of the public into the market place. There are many articles written daily reviewing the fluctuations of the shares traded in on the New York Stock Exchange, but the one thought, outspoken, and between the lines, is that the public refuses to speculate or even to invest. It is this situation which is partly responsible for the anxiety of the financial leaders to put together a copper merger. During the past four or five years trading in mining shares grew beyond all previous experience in this country, culminating in the activity of the Nevada stocks in the boom days of Goldfield. Familiarity with mining stocks, the losses incurred in many precious metal companies, and alleged safety and long life of the copper mining, led many from general mining shares into copper. A new leader, a new public to come into the market with it, is needed and a copper merger seems to be the most available material.——A year ago copper merger talk was heard everywhere; now it is being revived more strongly than at any time since Mr. Morgan went to Washington to obtain official sanction for the project and failed to get it. As might be expected, predictions are various. The different combinations mentioned include about all of the possible groups. There is no doubt that the step will be taken.——A 42-point rise in Calumet & Hecla is said to be due to the knowledge that the leader of the Lake region is now willing to become a part of a great consolidation, and by way of preparation is to form a holding company to take over the shares of the subsidiary corporations now in Calumet & Hecla treasury.

Butte, Montana, is receiving as much attention as though it were a new mining camp. The settlement of the North Butte-Tuolumne trouble and the buying of the latter for the account of the former; the making of the Butte-Ballaklava, the tremendous development of the East Butte; the opening of a rich orebody by the Butte Coalition; the difficulties of the Butte & Superior, all attract interest. North Butte has always been a public favorite, and anything which improves its position is welcomed.——The joint meeting of the Calumet & Arizona and the Superior & Pittsburgh boards has been adjourned to December 5, when it will be held in Chicago. Dividend action has also been deferred until that time.——One of the features of the mining situation is the extensive development of the various porphyries—the Ray Consolidated, Chino, Miami, and others. As part of the equipment for the Ray Consolidated and the Chino, D. C. Jackling recently purchased 58 automatic stokers, costing $60,000, of the Automatic Stoker Co. The significance of the transaction lies in the amount involved in supplying a minor part of equipment.——The holders of Greene Consolidated Copper have taken a new turn in their attempt to force an accounting from the Greene-Cananea organizers. Two holders, alleging that there is to be a new Cole-Ryan syndicate organized to control the copper output and the metal market of the United States and Mexico, have filed a suit asking that an exchange of Greene-Cananea for the shares of such new corporation be enjoined and also asking for a receiver for the old Greene Consolidated. There is some evidence that the various Cole Ryan properties are to be gathered together but at present it is certain that nothing more than a preliminary merger is contemplated. The ore shipments for the past week from Cobalt showed a material increase. Unless there is a decided falling off output the current year will furnish another high record for the camp. With increased milling facilities and higher prices for silver, Cobalt is earning greater net profits for its stockholders than ever before.——George Wingfield is to discuss the mining situation in Nevada at a banquet to be tendered to him in New York on December 30 by leading Nevada operators. There are many holders of cheaper Goldfield stocks who will be greatly interested in what the president of the Goldfield Consolidated will have to say, especially if he touch on the probable developments outside of the big company.——It is announced that the Montana Tonopah will become a dividend payer, distributing 5% before Christmas.

SALT LAKE, UTAH

Denial by D. C. Jackling.—Montana-Bingham.—Centennial-Eureka.—News of Other Properties.

D. C. Jackling, general manager for the Utah Copper Co., has denied the much published report that he is to accept the management of all of the Western interests of the Guggenheims.——The Montana Bingham Co., successor to the Bingham-Butte, has driven its main tunnel through a 100-ft. body of milling ore. Samples of the ore recently assayed from 1.7 to 3% copper, with streaks or high grade ore. A lower adit is being driven to cut this vein at depth. The Montana-Bingham is in good territory, being situated on the Quinn fissure which cuts through the Boston Con., Utah Copper, Starless, and others, and is considered the main copper-bearing fissure in Bingham.——Hugh MacDonald, superintendent of the Silver King Consolidated of Park City, has resigned his position on account of ill health and has been succeeded by James Mara.——The Little Bell Con., one of the properties opened by Mr. MacDonald, is just trying out its new mill. The plant has a capacity of 100 tons, which, with the shipping ore exposed in the mine, is expected to continue the dividends recently paid by the company.——The Centennial-Eureka has declared its second $3 dividend of this year, making a total of $27 per share since its purchase by the United States Smelting, Refining & Mining Co. in 1905. As there are 100,000 shares outstanding, this makes $2,700,000, to which should be added $2,917,000 paid before the property was sold.——The Iron Blossom has broken into a large cave similar to the one found in the Colorado which was productive of so much rich ore. The find was made on the 400-ft. level in the No. 3 workings. The cave is about 400 ft. long, north and south, and 60 ft. wide in some places.——The Lehi-Tintic Co. is planning to drive an 800-ft. adit which will tap the vein at a depth of 400 ft., and will cross-cut a considerable amount of promising territory.——The statement is made that work on the Jordan Valley railroad, to connect Alta with Jordan valley, will be commenced at once. Such a road would mean much to Alta district, but there is serious question as to its feasibility. It must follow a narrow canyon in which snowslides are common and in which the snow lies deep for five or six months of the year.——At the first session of the annual meeting of the Hornsilver Mining Co., T. Elliott Hodgkin was chosen director in place of A. I. Harrison, who died during the past year. Meantime some of the directors will visit the property so that a final decision on the building of a concentrating mill may be reached at this meeting.——A consolidation of the Baby McKee and Park City M. & P. Co. interests as the Howell Mining Co., has been effected. The property is in the south fork of Big Cottonwood canyon and not far from that of the Columbus Consolidated. The Baby McKee has been an important producer.

MEXICO

A Smelting Plant for Mazatlan. — Pacific Smelting & Mining Co. — Coal Production of Coahuila.—Montezuma Copper Co. — Cananea.—Matehuala Smelter.—Veta Grande.

Recent rumors of plans for the erection of a custom smelter at Mazatlan by the Guggenheim interests have been set at rest by the purchase of the concession for a custom plant there by the Pacific Smelting & Mining Co., the New York concern owning the smelters at Fundición and Guaymas, Sonora. The concession was granted by the Sinaloa government several years ago to A. H. McKay, then president of the Mercantile Banking Co. of Mexico City, and at that time closely identified with Southern Pacific interests in Mexico. The time limits for the beginning of construction and the blowing in of the smelter were extended some time ago, and the concession, which provides for important tax exemptions, continues effective. It is claimed the smelter will be built, and that western Durango, Tepic, and Jalisco, as well as Sinaloa, will contribute to it. Several months ago engineers, said to represent Standard Oil capital, visited mining districts of Sinaloa and Durango to investigate conditions as to the Mazatlan smelter project, and recently rumors of a 'trust' smelter at the Sinaloa port have been current. The Pacific Smelting & Mining Co. is not connected with the American Smelting & Refining Co., and with smelters at Guaymas, Fundición, and Mazatlan, it expects to have an important part in custom smelting in Mexico. Excellent progress has been made in securing contracts for copper and lead ores for the Fundición and Guaymas plants, and it is expected that both smelters will be in operation early in the coming year.——The growing importance of the coal and coke industry of the State of Coahuila is shown by a report covering production during the first nine months of this year, which gives a total of 1,213,163 tons of coal, and 165,653 tons of coke. The Mexican Coal & Coke Co., also operating the properties of the Coahuila Coal Co. and the Fuente Coal Co., is the largest producer of coal in that State, the output for the 9 months reaching 474,804 tons, with 36,029 tons of coke. The Compañia Carbonifera de Agujita ranked first in the production of coke, with a total of 83,575 tons, and produced also 168,584 tons of coal. A merger of this company and the Compañia Carbonifera de Lampacitos was effected some time ago, and the production of the latter, 19,373 tons of coke and 86,593 tons of coal, makes a total for the merged interests of 102,948 tons of coke and 255,177 tons of coal. The only other Coahuila concern producing coke is the New Sabinas Co., Ltd., which had an output in the 9 months of 71,623 tons of coal and 26,676 tons of coke. The production of the other coal concerns of the State was as follows: Compañia Carbonifera de Sabina, 210,837 tons; Compañia C. del Norte, 74,044; Compañia C. de Ciudad Porfirio Diaz, 59,269; Compañia C. de Rio Escondido, 63,609; Compañia C. El Fenix, 3791. The National Railways of Mexico (government merger system) some time ago granted a freight differential in favor of Coahuila coal and coke as against the imported products, and this has resulted in benefit to the Coahuila operators. ——The 1910 output of the Moctezuma Copper Co., operating the big Pilares mine of the Phelps-Dodge interests at Nacozari, in Sonora, will fall short of that of last year. Scarcity of water at the end of the long dry season resulted in the closing down of one unit of the 2000-ton concentrator, and the plant was operated at half capacity for some time. Last year the concentrator treated 510,094 tons of ore, producing 110,725 tons of concentrate containing 13,059 tons of copper. The net earnings were $1,104,454. It is estimated that the ore handled this year will not exceed 450,000 tons. Two aerial tramways built to carry tailing to storage grounds some distance from the river bed, where they are now deposited, will be in operation before the end of the year.——Bins to receive Miami concentrate are being built by the Cananea Consolidated Copper Co. Deliveries of Miami Copper Co. concentrate at Cananea are expected to start about January 1. The Cananea Consolidated has contracted for California fuel oil, which will be used instead of the Texas product. The present consumption is about 800 bbl. per day, and with the new reverberatory in operation and the central power plant completed the amount will be increased.——The Sonora Copper Smelting Co., which is building a 100-ton smelter at the Cobre Grande camp, three miles east of Noria, under a State concession granting exclusive tax exemptions in the Magdalena district of Sonora for 20 years, has ordered an aerial tramway to convey ore from the mine to the plant, a distance of 3500 ft.——The American Smelters Securities Co. is building an additional 500-ton furnace at its Matehuala smelting plant in the State of San Luis Potosi. This plant was purchased by the Guggenheim company early in the year from the National Metallurgical Co. The new furnace will give Matehuala a capacity of 800 tons per day. The Guggenheims previously owned the Dolores mine in Matehuala camp, and several other mining properties were acquired when they purchased the smelter.——The Veta Grande mine at Zacatecas, a famous antigua, is under option to English interests, but its purchase is by no means certain. The dump at the Veta Grande is probably the largest now in Mexico; it has been picked over repeatedly, and the average value is low. Veta Grande was formerly worked by the Anglo-Mexican Mining Co. of London. It is now owned by Mexicans.

BUTTE, MONTANA

November Output of Three Smelters. — Copper Production of Butte Mines for November.

The November copper production by the Washoe smelter at Anaconda, the Boston & Montana smelter at Great Falls, and the East Butte smelter, at Butte, aggregated 23,636,550 pounds. This is the quantity of the metal the Anaconda and associated companies plan to produce under the copper producers' agreement for curtailment. When some of the mines, by reason of the high grade of ore that is shipped, run over their allotment, the output of ore is cut down. For instance, the Butte Coalition mines are now shipping only about half the tonnage that was sent out before the curtailment agreement, its ore having for some time averaged higher in copper. The estimated tonnage of ore smelted, from the mines of the different companies, and the production of blister copper therefrom, for the month of November were as follows:

Companies.	Tons of Ore.	Lb. of Copper.
Boston & Montana	90,000	6,300,000
Anaconda	121,500	7,411,500
Butte & Boston	12,900	799,800
Washoe	12,150	741,150
Parrot	6,000	360,000
Trenton	12,300	762,600
North Butte	31,500	1,953,000
Butte Coalition	30,000	2,100,000
Original	21,000	1,302,000
Tuolumne	9,000	900,000
East Butte	9,150	1,006,500
	355,500	23,636,550

According to the best information obtainable, the Butte & Superior company is recovering from its financial reverses and when certain obligations come due early in the year the money will be forthcoming. When the Butte & Superior company took over the Butte-Milwaukee, it obligated itself to do certain development in addition to meeting certain indebtedness. The money to be paid is due in March next, and development is proceeding according to agreement. It was stipulated that the Butte & Superior should cross-cut through into the Butte-Milwaukee and this is being done. It is expected that an official announcement will be made soon that the bond issue has been taken care of, and that the proceeds, together with the earnings of the company, will give all the financial aid required to place the company in a good position. The company is now earning at the rate of about $30,000 per month, and it is believed this rate will be maintained.

General Mining News

ALASKA

The following was paid in San Francisco on November 28, 1910: The Alaska Treadwell Gold M. Co. dividend No. 91 of $1 per share. Alaska Mexican Gold M. Co. dividend No. 61 of 5c. per share. Alaska United Gold M. Co. dividend No. 15 of 10c. per share.——Under direction of the Alaska Road Commission, a trail is being made from Nome to Iditarod and from Iditarod to Seward and Coppina. W. P. Richardson, at the head of the Commission, states that the entire trail will be brushed out by February 1. Sites for road houses are being designated, and the trail will be finished next summer.

ARIZONA

COCHISE COUNTY

The Copper Queen smelting plant, at Douglas, with nine furnaces in blast, produced 8,800,000 lb. of copper in October. Besides ores received from the Copper Queen mines and those of allied interests, a good tonnage of custom ore is received, one of the Bisbee customers being the Shattuck. At this plant is smelted the concentrate turned out at the mill of the Montezuma Copper Co. at Nacozari, Sonora. An additional brick stack, 300 ft. high, 14 ft. diam., is to be built to serve the reverberatory furnaces and roasters.——On the property of the Tombstone Con. M. Co. an important find of ore was made on the 800 ft. level, which is considered a continuation of the West Side lode. The west drift on the 1000 ft. level has been advanced 260 ft., and cross-cutting along the contact is being pushed. The normal pumping record is 6,800,000 gal. per day.——The new crushing and cyanide leaching plant of the Commonwealth M. & M. Co., at Pearce, is finished and in operation, treating 125 tons per day. The new plant replaces one that was destroyed by fire several months ago.

GILA COUNTY

(Special Correspondence.)—The total amount of underground work accomplished by the Inspiration Copper company is 30,000 ft., and the churn-drill work during the past year and a half aggregates 40,000 ft. Three churn-drills are in operation on the highest part of the property. The force underground does about 550 ft. of driving and raising each week. T. R. Drummond, manager, is employing 160 men.——The Arizona Commercial Copper Co. has a new diamond-drill with which it is prospecting below the seventh level. The seventh hole was abandoned on account of a bit having been lost. The eighth hole will be put down 456 ft. north of the Eureka shaft and will tap the Black Hawk vein at a depth of 870 ft. The Eureka shaft is about 940 ft. deep, the tenth level in it will be established 1010 ft. from the surface, to correspond with the tenth level of the Superior & Boston mine, soon to be established. In this way proper ventilation for the workings of both mines will be provided.——The winze being sunk on the Old Dominion vein by the Arizona-Michigan Mining Co. has attained a depth of 155 ft. below the 500-ft. level, the bottom of which is in quartzite.——At the Superior & Boston mine, a drift on the eighth level has opened ore 150 ft. farther east than the orebody on the sixth level. In the face of the drift the ore ranges from 1½ to 3 ft. in width, and while the assays are not uniform some of them run 6.6% copper, the ore being oxidized.——The Barney Copper Co., organized several months ago by John D. Coplen of Globe, has purchased a Star churn-drill from the Cactus Copper Co. for use on Barney property adjoining the Live Oak holdings.——The Boston-Miami Copper Co. has moved its camp to the part of its property nearest the Live Oak, and has two churn-drills, with one of which a hole is being sunk on the Montezuma group of claims which was recently purchased.

Globe, November 26.

YAVAPAI COUNTY

The Venezia mine and mill are in operation in Crook canyon. The mill has 10 stamps, and amalgamating plates, the ore containing free gold. The mine is being [illegible] developed and a steady production [illegible]. A shipment of 30 tons of ore from the Crescent & [illegible] on Lynx creek to the Poland mill ran $[illegible] per ton.

YUMA COUNTY

Josiah Winchester and his two partners have [illegible] A mine and built a 10-stamp mill near Vicksburg. It is said they have 100,000 tons of ore accessible in the mine, and that the dump, the principal metal of value being gold, assays 3% lead. There is a little copper. The mill is reported ready to be operated. The ore runs $8 to $12 per ton.

CALIFORNIA

AMADOR COUNTY

It has been decided to sink a 2000-ft. shaft on the Harrington mine, situated near Middle Bar. The South Eureka stockholders have financed the enterprise and J. J. Varney, of San Andreas, has charge of the work. A hoisting engine, formerly in use at the Gwin mine, has been installed at the Hardenburg. The property was developed by a shaft 1000 ft. on the vein, sunk nearly twenty years ago by Hayward, Lane, and others.

CALAVERAS COUNTY

In the suit of James V. Coleman against the Lightner M. Co., the Third District Court of Appeals denied the application of the latter for a writ of prohibition to restrain the Superior Court of Calaveras county from proceeding with the trial. The title to a valuable piece of mining property is involved, and the company sought to delay trial of the case until the U. S. Land Office finally decided as to the issuance of a patent for the land in dispute.——A gold dredge is being built near Mokelumne hill to handle the hydraulic tailing on Chili gulch, the depth of which varies between 10 and 100 ft.——The Calaveras Copper Co. has acquired the Union copper mine, the holdings of which cover a mile on the strike of the copper zone.

INYO COUNTY

The Skidoo Mines Co., for the month of October, milled 1440 tons of ore, recovering $13,577.15 in bullion and producing concentrate estimated at $175; total, $13,752.15. Operating costs, $7833.93; development, $705.50; net profit for the month, $5212.72.

SIERRA COUNTY

Sol. Camp and associates, who have a bond on the Amethyst of the South Fork M. Co. at Forest, have opened a 4-ft. vein of ore containing free gold and arsenical pyrite.——A carload of ore shipped last week from the Red Star mine at Alleghany is said to have had a gross value of $5000. There is 6 ft. of ore in the vein.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.)—Work was resumed this week on the Bellevue-Hudson mine, on Columbia mountain. It is proposed to sink the shaft 200 ft., and levels will be extended southwest from each 100-ft. station. Shipments of ore will be commenced at once.——Alkire & Co., leasing on the Seven-Thirty mine, have shipped some ore running 300 oz. in silver. Stoping in progress has exposed a streak of mineral from 8 to 12 in. wide.——Frazer & Co., working through the Hercules adit, have encountered an 8-in. streak of ore on the Seven-Thirty vein that mills from 425 to 450 oz. silver per ton.——The Amy property on Leavenworth mountain has been taken under bond and lease by W. S. McGintie and work will be commenced. There is exposed in the adit a streak of ore 18 in. wide, assaying 1 oz. gold and 14 oz. silver per ton.——Gava & Co., leasing on the fourth level of the Smuggler mine on Brown mountain, are making regular shipments of ore, settlement for which shows $400 net per ton.——A new house is being constructed at the property of the Accord M. & M. Co., on Saxon mountain. Within the next two weeks machine-drills will again be brought into use and the adit will be driven 600 ft. farther to intersect the series of veins on the property.——The Alco M. & M. Co. is driving an adit, expecting to intersect a vein in a few days.——Another con-

tract will shortly be awarded to drive the Prudential adit 100 ft. It is now in 869 ft. F. A. Maxwell is manager.——A small streak of ore has been uncovered in the breast of the adit being driven on the McKinley vein. Tests show from $75 to $80 per ton in gold and silver.

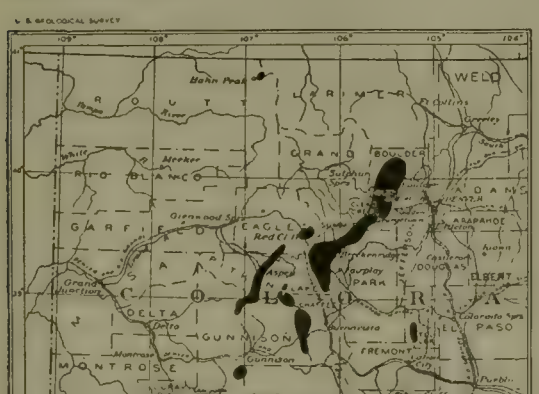
Georgetown, November 22.

EAGLE COUNTY

The Killingsworth property of 8 claims, in Horn Silver mountains, near Red Cliff, has been partly developed by Elizabeth K. Brown, who has a vein of manganese ore 16 ft. wide, within which is a 2-in. streak of bismuth, 2 ft. of graphite, and a streak of black sulphide ore carrying gold and silver. The bismuth ore is said to run high in that metal. Further development is in progress.

LAKE COUNTY

Mining conditions at Leadville are steadily improving. This is being brought about by the increasing production of zinc carbonate, the opening of good orebodies in mines which were thought to have been worked out, and the advance in the price of silver. A number of new shafts are being sunk and work has been resumed in several old properties which had been idle. There is marked activity on Fryer, Rock, Carbonate, and Breece hills, and at the head of Big Evans gulch.——Ore shipments are regularly made from the Stevens shaft, on which Thomas Smith and associates have a lease. The ore is taken from an 8-ft. vein, 4 ft. of which samples 60% lead. In another part of the mine zinc carbonate ore is being obtained. The mine is on



Mineral Districts of Colorado.

Rock hill.——Zinc carbonate has been discovered by lessees at the Little Giant, on Carbonate hill. The body of ore opened has a strike south.——The Bertha, on Breece hill, since having been unwatered, is being further developed by lessees, who contemplate sinking the shaft 100 ft. deeper, to enable them to get at the different ore-shoots on their dip. The other mines in this vicinity which are operating consist of the Penn, Ballard, Curran, Grand Prix, Galesburg, Big Six, Highland Mary, and Black Prince, all of which are shipping ore.——The Nevada claim, east of the Little Johnny, on Breece hill, is under lease to Thomas Simpson and associates, who in the last two months have unwatered the shaft, put it in order, and cleaned out the levels. Pay-ore, consisting of lead sulphide, with silver and gold, was found 60 ft. below the surface, some of which is being shipped to the smelter. Smithsonite has been found in this mine, but the tonnage obtainable is small.——The Forest City, on Carbonate, under lease to W. A. Young, is producing iron ore which is being shipped. A body of lead ore, containing silver, has been discovered.

SAN JUAN COUNTY

The Ledge Con. M. Co., operating near Silverton, is concentrating 100 tons of ore and producing one car of concentrate daily. The sixth station has been cut in the shaft, and from it a cross-cut is being driven to the orebody which was opened and mined on the fifth, fourth, and third levels. ——The Iowa-Tiger Leasing Co., operating the Iowa and Tiger mines in Silver Lake basin, is shipping ore to the smelter and receiving encouraging returns. Development to open the shoot of ore at a lower level is in progress.——Among the other mines operating in the vicinity of Silverton are the Hercules, Gold King, and Sunnyside. The Gold Prince, after a run of five months this year, has closed down. It is a property which has been equipped at great expense.——The Intersection was operated successfully by the owners a part of the season, and was then leased to local men.——The Highland Mary, in Cunningham gulch, which operated during the summer and autumn, has closed down for the winter.——The Vermillion mill has been closed for the winter, but work in the mine is to continue, the plan being to have an ore supply by spring that will keep the mill operating next summer.——The Frank Hough mine, on Engineer mountain, will be further developed this winter. The final shipment of the year was made last week.

IDAHO

ADA COUNTY

(Special Correspondence.)—The Geo. F. Roth M. Co. has erected a 10-stamp mill which began operating on November 17. The plant has one classifier, two Wilfley tables, tube-mill, Portland filter, and cyanide leaching tanks. The concentrate is pulverized in the tube-mill and then cyanided. The plant was designed and built by F. M. Field. The property is in the Neal district.

Boise, November 26.

IDAHO COUNTY

The South Fork mine of the Elk City Mines Corporation, situated near Elk City, recently produced $2500 in gold bullion, which was recovered on amalgamating plates in the company's mill. The ore from which the gold was extracted was taken from a 6-ft. vein. J. T. Omo and associates of Spokane are in control of the mine.

LEMHI COUNTY

The Red Bird mine, 14 miles from Salmon, is developed by 2500 ft. of work, which opens on several levels a quartz vein between porphyry and slate; the ore is said to carry free gold assaying $5 per ton. It is stated that a large tonnage of ore is exposed in the stopes.——The Pittsburg-Idaho mine at Gilmore is said to be shipping daily 50 tons of ore.

SHOSHONE COUNTY

The Caledonia M. Co., for which Charles McKinnis of Wallace is manager, shipped silver-lead ore valued at $200,000 during August, September, and October. A raise in ore was made from the 500 to the 300-ft. level, and it is estimated that 50% of the ore between those levels is of shipping grade. In driving from No. 5 adit a body of shipping ore has been opened a length of 150 ft., with the face of the drift still in ore. The first-grade ore is accompanied by a big tonnage of ore of milling grade.

MICHIGAN

The Seneca, controlled and financed by the Calumet & Hecla, has the cropping of the Kearsarge lode for 1400 ft. between the Gratiot and Ojibway; also the underlie of the Kearsarge below the entire Gratiot property, and below parts of the Mohawk and Ahmeek. Satisfactory copper ore has been developed on the Kearsarge lode on the 920-ft. level. The drifts being advanced are carried 9 ft. wide instead of 6 ft. The shaft is in the foot-wall of the lode, and a number of cross-cuts have been driven to the vein. ——The United States Smelting, Refining & Mining Co. has an option on the Clark property in Keweenaw county, on which it has been exploring for several months with diamond-drills. The property is said to extend three miles south from Copper Harbor.

MONTANA

BROADWATER COUNTY

The Keating Gold M. Co., operating in Radersburg district, has sunk its new shaft to a depth of 600 ft. and is hoisting ore from the 500-ft. station. Driving on the 600-ft. level has reached a point 1000 ft. north from the shaft, all of which was in ore. This with 1200 ft. of driving on the vein south of the shaft, opens the vein 2200 ft. on its strike at the 400-ft. level. In October 40 cars of ore were shipped to a Butte smelter, the returns showing an average of $19 per ton. The November shipments were between 50 and 60 cars. R. Hightower is mine superintendent.

DEER LODGE COUNTY

(Special Correspondence.) The French Gulch M. Co. has 22 lode and 6 placer claims on French gulch, 21 miles south of Anaconda. Placer mining, which began here in 1865, has continued with little interruption since that date. In the last ten years quartz claims have been located at the heads of the ravines, and several veins and fissures of ore opened by shafts and adits. The country rock is granite, cutting through which are alternating dikes of basalt, porphyry, and aplite, having a north-south course. The three principal veins of the group strike east-west, and consist of fissures in granite, dipping 70° south. There are several porphyry intrusions into the veins, and these are considered the sources of mineralization. The croppings of these veins are defined and readily traceable. Development on one vein consists of several adits, one of which is 900 ft. long, and a 3-compartment vertical shaft, 200 ft. deep, from the bottom of which there is 850 ft. of driving on the veins. A raise of 135 ft. on the vein from this level connects with a surface adit. Development on the other two veins aggregates over 2000 ft. According to J. E. Beveridge, of Salt Lake, the ore occurs as sulphide and oxide, carrying gold, silver, and lead, with less than 1% copper, about 20% iron, and 20 to 27% silica. In the course of development 140 tons of ore was shipped which sampled $15 per ton, the greatest value being in gold. The property is equipped with ample buildings, hoisting engines, air-compressors, and steam-pumps. The company's placer holdings are said to include 200 acres of virgin ground. It is claimed that 15 acres of this was tested by sinking numerous pits to bedrock, the result showing 55c. per cubic yard. There is a good deal of placer mining equipment on the property, including an Evans hydraulic elevator, 1000 ft. of sluice-boxes, and 1300 ft. of 6, 8, and 16-in. iron pipe.

Anaconda, November 22.

LEWIS AND CLARK COUNTY

The construction of the plant of the Northwestern Metals Co. is in progress at Helena. These works are designed to treat the complex refractory ores of that part of the State. A. W. Burwell and C. C. Titus are active in the company as metallurgists.

NEVADA

ELKO COUNTY

Contact district, situated in the northern part of the county, 50 miles north of Wells, and 30 miles east of Jarbidge, has deposits of copper ore in limestone, veins on the contact of limestone and granite, deposits of copper carbonate a short distance from the contact, and low-grade chalcopyrite in limestone 200 ft. from the main contact. Exploration work by the United States Smelting, Refining & Mining Co. has been carried on during the past year. Development has progressed to some extent on a number of properties. The nearest railroad station is Rogerson, Idaho.

LINCOLN COUNTY

The Centennial-Pioche Co. has struck ore and a strong flow of water at a depth of 510 ft., and is installing a new 50-hp. hoist, cage, and pumping plant. The ore found at this depth is in limestone.

NYE COUNTY

(Special Correspondence.)—The Canyon mill, situated on the outskirts of Manhattan, is owned by the Manhattan Milling & Leasing Co., for which S. W. Stoffer is manager. The plant originally equipped with a 10-stamp mill, plates, tables and cyanide tanks now has in addition to these a Bryan mill and is fine grinding. The recovery by amalgamation is raised so high that cyanidation may not be necessary. Experience in this camp has proved that a high saving of gold is possible by adopting fine grinding and careful plate work. The ore received at the mill runs $18 to $20 per ton, and it is estimated that a saving of 92% can be made. The ore passes to a crusher, thence through a 6-ft. Huntington to silver-covered copper plates, having four drops. The tailing passes to a cone sizer, from which the oversize is elevated to the 6-ft. Bryan mill. The slime from the classifier joins the slime from the Bryan mill at the head of another amalgamating plate, the tailing from the latter going to waste. The machinery is now operated by electric power, and the mill capacity is being increased from 24 to 40 tons per day.——The War Eagle mill treated 400 tons of ore taken from the dump of the Big Four mine, the recovery of gold and silver therefrom amounting to $40,000. This ore belonged to Steen, Poak, and Chapman, of the Big Four Leasing Company.

Manhattan, November 25.

The Tonopah Belmont Development Co., for October, milled 6546 tons of ore, and shipped to smelters 1135 tons. The precious metals extracted from both classes of ore consisted of 2492 oz. gold and 249,491 oz. silver, the gross value being $215,056. The net profits for the month are given at $102,469.

WHITE PINE COUNTY

The Amalgamated Nevada Mines Co., operating at Blackhorse, has put in operation its new 10-stamp mill. The company is said to have 1500 tons of ore ready for the mill that will assay $30 per ton. Part of this is is taken from the company's San Pedro claim, on which are an 800-ft. shaft, and a 160-ft. incline.——It is announced that the Ohana M. Co. has decided to erect a mill, the machinery for which has been ordered. Blackhorse is in the vicinity of Osceola.

UTAH

JUAB COUNTY

An important find of ore was made in the Uncle Sam mine, in Tintic district, by driving westerly on the level below the main adit. The vein thus opened strikes northwest, with a dip east. The new orebody is being developed by raises from the lower level; thus far it has a width of 5 ft.——The new shaft of the Eagle & Bluebell mine has been timbered to the 1000-ft. station, and ore-hoisting has commenced. The new shaft facilitates mining operations, and establishes better ventilation in the mine.——Two drifts are being run in the Mammoth mine; one of these is from the 1300-ft. level, the other from the 2100. The purpose of the latter is to develop an ore-shoot which was opened on the 1900-ft. level.

SALT LAKE COUNTY

Concentrating tables and other equipment are being installed for the third and fourth units of the mill of the Ohio Copper Co. Each of the four units has the capacity of 625 tons of ore per day.——The Utah-Apex mine, situated on Carr fork, Bingham district, has been developed during the year ended September 1, by 1545 ft. of driving, and 379 ft. of raises; stations cut amounted to 20,767 cu. ft. Important in the year's work was the finding of fissures and bedded veins on the fourth level in the western part of the property. No. 7 level, now in 500 ft., is expected to result in opening similar orebodies. The lead ore opened and available is estimated by E. P. Jennings at 111,500 tons. For eight months ended August 31, 1910, the amount received for ore sold was $311,583; mining costs, $202,388; development, $28,177; net profit, $81,017. As reported in last week's issue, no milling ore is to be mined for several months, during which period the mill is to be overhauled and the mine development pushed with vigor.——The new mill of the Utah Leasing Co. is finished and in operation. It has a crusher, rolls, and concentrating machinery. This company has a lease on the Old Telegraph mine of the

United States Smelting, Refining & Mining Co. The Last Chance mine of the Nevada-Utah company, situated in Bingham district, is under lease to Morris P. Kirk, who intends to mine on his own account, and will let several sub leases. The property is well developed to a depth of 900 ft. The ore contains lead, silver, and gold.

SUMMIT COUNTY

The larger ore shippers of Park City district are the Daly-Judge, Silver King, Daly West, American Flag, and Little Bell. All of these, except the American Flag, operate concentrating mills and ship the greater proportion of their output in the form of concentrate. In this may be included the lessees at the Ontario, who are mining and shipping 50 tons per day of high-grade ore.

NEW MEXICO

DONA ANA COUNTY

Paul B. Davis, who has been developing the Philadelphia group of claims situated in the Organ mountains, recently shipped a lot of ore to the smelter at El Paso to be tested. According to assays the ore runs high in silver and lead. The properties are out from Las Cruces.

SOCORRO COUNTY

(Special Correspondence.)—The management of the Socorro mine has decided to develop in all parts of the mine and block out ore sufficient to justify doubling the capacity of the mill. This company has thus far followed a conservative policy, proceeding more cautiously than its immense holdings would seem to warrant. It owns a vast acreage of unproved ground surrounding the Fannie-Consolidated veins and over 7000 linear feet on these two lodes, less than one-tenth of which has been explored on the lower levels. Drifts have been advanced both east and west on the 600-ft. level, over 500 ft. of which was in the orebody cut several months ago. In a number of places it has a width of 25 ft., while in other places the walls have not been reached. It is a well-defined contact vein. The daily average samples taken from a raise being driven to the fifth level have assayed about $25 per ton. Air-drills are being operated in the various headings and the three-compartment vertical shaft will be sunk to the seventh and eighth levels, where it is expected to intersect the vein on its dip. Regular shipments of bullion and concentrate are being made.——The concentrating plant of the Ernestine M. Co. last week crushed 668 tons of ore, from which was produced 58 sacks of high-grade concentrate, in addition to the precipitate from the zinc boxes. The ore encountered several weeks ago in the eleventh level west, continues to hold its width and high grade.——The oil engines have been delivered at the mill of the Deadwood mines and the milling plant will probably be started soon after January 1, 1911. The batteries and tanks are in place and the pipe-line is being laid. In the mine, cross-cutting continues on the 500-ft. level.——The Oaks Co. has opened a 5-ft. vein on the Myrtle mine. A drift is being run east at the bottom of the Abe Lincoln 100-ft. shaft on a 4-ft. vein.——The Mogollon Gold & Copper Co. expects to equip the boilers with oil burners and discontinue the use of wood as fuel.

Mogollon, November 26.

WASHINGTON

FERRY COUNTY

(Special Correspondence.)—The Republic Mines Corporation, operating the Lone Pine, Surprise, and other properties in Republic district, is employing a big force of men and shipping 3000 tons of ore per month to the smelters. The incline shaft, which is being sunk as rapidly as possible, is expected to reach the main orebody at a depth of 500 feet.

Republic, November 26.

CANADA

BRITISH COLUMBIA

(Special Correspondence.)—The Consolidated company is making arrangements to begin shipments from the Phoenix-Amalgamated group. The ore is of low grade, but it is valuable at the Trail smelter as a flux.——The shipments of ore from the Rawhide mine were increased during the past week. A force of 180 men is now employed.——At the Athelstan mine of the New Dominion Copper Co. arrangements are being made to resume ore shipments, at least by the end of the year.——The net profits of the Hedley Gold Mining Co. for September were $27,688, making a total of $197,529 for the first nine months of the year.——The shipments of ore from the Boundary district for the week ended November 19 were: Granby mines, 18,352 tons; Jackpot, 714; Mother Lode, 9335; No. 7, 26; Rawhide, 4200; Snowshoe, 2400.

Phoenix, November 26.

(Special Correspondence.)—The usual conditions prevailed at Rossland during the past week, the Centre Star-War Eagle, Le Roi No. 2, Ltd., Le Roi, and Nickel Plate shipping, with work going on at the Mayflower, I. X. L. Cliff, and other properties.——At the Trail smelter of the Consolidated company about 1300 tons of mixed ore per day is being treated. Over 400,000 tons has been treated thus far this year, which is in excess of last year's tonnage.——The shipments of ore and concentrate from this district for the week ended November 19 were as follows: Centre Star-War Eagle, 4118 tons; Le Roi No. 2, Ltd. (part concentrated), 596; Le Roi mine, 339; Nickel Plate lease, 30 tons.

Rossland, November 25.

MEXICO

DURANGO

Assurances are given in Mexico City that the Mexico International next year will extend its railroad from Tepehuanes to Guanacevi, the latter being an important mining and milling centre some 60 miles from the former.——La Union mine at Indé is sending 25 to 30 tons of sulphide ore to the La Roca smelter.

HIDALGO

The Real del Monte of Pachuca has awarded to the Pachuca Foundry Co. the contract for erecting an aerial tramway from the Barron mine to the former's Loreto mill in the upper part of the town. This mine is in the eastern part of the Pachuca district, being one of the Real del Monte's several properties. The tramway to be built will be between three and four miles long, and will have steel towers; its capacity will be 40 tons per hour.

GUERRERO

The Guerrero M. & M. Co., controlled by Colin Timmons, has developed two shoots of ore in Las Varones mine, an antigua that was operated 100 years ago. One shoot is reported to be 490 ft. long and 11 ft. wide; the other 360 ft. long and 4 ft. wide. The ore contains silver and gold and is said to exceed $30 per ton. Mr. Timmons has purchased and shipped to the property a Lane slow speed mill and other equipment. The mine is out some distance from Taxco.

CENTRAL AMERICA

COSTA RICA

(Special Correspondence.)—The Montezuma Mines of Costa Rica, for the month of October, continued mining and development on the Montezuma, San Rafael, and San Juan veins. The ore trammed from the mine to the mill-bins for this month amounted to 1326 tons, of which 1215 tons was treated, the mill feed sampling $8.76 per ton. The tailing averaged $0.84, the apparent extraction was $7.92, the gross production being $9642.80. It is stated that the November tonnage will be much larger than that of the previous month. The cyanide consumption for October was 4¼ lb., but this high figure is said to be due to the higher percentage of cyanide in solution at the end of the month. Sodium cyanide is being used this year. On October 20 the zinc boxes were cleaned up, and the 696 lb. of precipitate, averaging 0.55 oz. gold and 1.2 oz. silver per pound, was shipped to New York. The mining cost was $3.50; milling, $2.92; total, $6.42 per ton.

Montezuma, November 1.

Personal

Professional men are invited to send items of their engagements and travels. Such news is interesting to friends.

MARK R. LAMB is at Callao, Peru.

SCOTT TURNER is at Lansing, Michigan.

S. H. BALL is in London, having returned from Siberia.

J. P. HUTCHINS has returned to New York from London.

FRANK A. KEITH has returned to Los Angeles from Mexico.

H. KILBURN SCOTT has left for Brazil on professional business.

S. E. BRETHERTON has returned to San Francisco from Sonora, Mexico.

O. H. PACKER is examining the Alpha mine at Sutter Creek, California.

BUCKLEY WELLS, of Denver, was at the St. Francis in San Francisco last week.

N. TRELOAR, superintendent for Calaveras Copper Co., Copperopolis, is in San Francisco at the St. Francis.

L. L. HUTCHINSON has resigned from the Oklahoma Geological Survey to engage in private professional work.

G. F. ROWE is to examine the Mason Valley mines at Yerington, Nevada, and the Inspiration at Globe, Arizona.

R. H. CHAPMAN has completed his season's work in British Columbia for the Canadian Geological Survey and gone to Ottawa.

S. B. CHRISTY has been confined to his home at Berkeley, California, by sickness thought to be due to ptomaine poisoning.

BRAYTON P. CAMPBELL was in San Francisco this week on his way to National, Nevada, where he will have charge of the National mill.

C. H. C. MULLER and GILMORE GOODLAND, of London, are in New York on the way to Mexico to examine the properties of the Batopilas Mining Company.

C. A. WECK, superintendent for the Bluestone Mining & Smelting Co., at Yerington, Nevada, has returned from a visit to the Globe and Miami districts, Arizona.

F. OSKAR MARTIN, mineral inspector for the General Land Office, has returned to San Francisco from an examination of quicksilver deposits in Lake and Sonoma counties.

FITZ JAMES MCCARTHY, widely known in mining circles of the West as 'Fitz Mac,' died at Phoenix, Arizona, November 13. As a newspaper writer on mining topics he had done much to advertise the West.

OBITUARY

ALMON D. HODGES, who was born at Providence, Rhode Island, in 1843 and died at Roxbury, Massachusetts, November 7, was especially well known to the mining engineers of the Pacific Coast. After graduating at Harvard, serving in the Civil War, and studying at Freiberg, he came to San Francisco in 1869. For three years he was connected with the *Mining and Scientific Press*, first as associate editor and later as editor. Although he was then but a beginner his work was characterized by accuracy in technical matters and style which made his writings a delight to readers. In our anniversary number of May 21, 1910, Mr. Hodges gave some account of San Francisco as he knew it at that time and penned a charming and graphic picture. In 1871 he left the *Mining and Scientific Press* to take up engineering work, beginning, as he has related, as a workman in one of the Comstock mills in order to remove the taint of schooling and obtain recognition as a 'practical man.' This came quickly, and his practice in subsequent years extended over the whole West as well as abroad. Some years ago he retired from general work, although he retained some consulting practice to the end. He lived in Boston, but was a frequent visitor in San Francisco, where he had many friends and club associates.

Market Reports

LOCAL METAL PRICES

San Francisco, December 1

Antimony	12–12½c	Quicksilver, flask	$60–65
Electrolytic Copper	13½–13¾c	Tin	39½–40
Pig Lead	4.75–5.00c	Spelter	7–7½

Zinc dust, 100-lb. casks, per 100 lb., small lots $9.50, 25-lb. lots $9.75, large $9.20 net.

METAL PRICES

By wire from New York

Average daily prices in cents per pound

Date	Electrolytic Copper	Lead	Spelter	Silver, per oz
Nov. 24	Holiday.	No market		
" 25	12.75	4.50	5.84	56⅛
" 26	12.75	4.50	5.84	55⅝
" 27	Sunday	No market		
" 28	12.74	4.50	5.83	55⅛
" 29	12.74	4.50	5.81	54
" 30	12.73	4.50	5.78	55

ANGLO-AMERICAN SHARES

Cabled from London

	Nov. 24 £ s. d.	Nov. 10 £ s. d.	
Camp Bird	1 10 0	1 10 3	ex div.
El Oro	1 6 0	1 6 0	
Esperanza	1 19 0	1 18 9	
Dolores	1 5 0	1 5 0	
Oroville Dredging	0 7 0	0 6 6	
Mexico Mines	7 5 0	7 10 0	
Tomboy	0 18 0	0 18 2	

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Dec. 1.		Closing prices, Dec. 1.
Adventure	$ —	Mohawk	$ 45
Allouez	40	North Butte	30
Atlantic	6	Old Dominion	40
Calumet & Arizona	51	Osceola	127
Calumet & Hecla	543	Parrot	12
Centennial	15	Santa Fe	1⅞
Copper Range	67½	Shannon	11⅜
Daly West	3⅛	Superior & Pittsburg	12¼
Franklin	10	Tamarack	57
Granby	40	Trinity	5
Greene Cananea, ctf.	7	Utah Con.	16¼
Isle-Royale	18⅞	Victoria	2
La Salle	7¼	Winona	8¼
Mass Copper	8⅝	Wolverine	120

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Nov. 30.		Closing prices, Nov. 30.
Amalgamated Copper	$ 65¾	Miami Copper	$ 19⅜
A. S. & R. Co.	77¼	Mines Co. of America	5
Braden Copper	4	Montgomery-Shoshone	1/16
B. C. Copper Co.	6½	Nevada Con.	19⅜
Butte Coalition	19¼	Nevada Utah	1
Chino	24	Nipissing	10⅞
Davis Daly	1⅝	Ohio Copper	1⅝
Dolores	5	Ray Central	2¼
El Rayo	3⅛	Ray Con.	19⅜
Ely Central	1/16	South Utah	1¼
First National	2	Superior & Pittsburg	13¼
Giroux	7⅛	Tenn. Copper	36¼
Guanajuato Con.	⅜	Trinity	6⅝
Inspiration	9⅞	Tuolumne Copper	5
Kerr Lake	7⅜	United Copper	5¼
La Rose	4⅜	Utah Copper	46¼
Mason Valley	9⅜	Yukon Gold	3⅞

SOUTHERN NEVADA STOCKS.

San Francisco, December 1.

Atlanta	$ 13	Mayflower	$ 5
Belmont	4.35	Midway	19
Booth	7	Montana Tonopah	95
Columbia Mtn.	3	Nevada Hills	2.20
Combination Fraction	15	Pittsburg Silver Peak	60
Fairview Eagle	10	Rawhide Coalition	5
Florence	1.60	Rawhide Queen	—
Goldfield Con.	8.20	Round Mountain	35
Gold Kewenas	7	Silver Pick	7
Great Bend	3	St. Ives	14
Jim Butler	28	Tonopah Extension	1.02
Jumbo Extension	25	Tonopah of Nevada	8.25
MacNamara	23	West End	50

(By courtesy of San Francisco Stock Exchange.)

COMSTOCKS

San Francisco, December 1.

Alpha	$ 3	Hale & Norcross	$ 12
Alta	10	Julia	5
Andes	3	Justice	2
Belcher	38	Kentuck	2
Brunswick Chollar	21	Mexican	85
Brunswick Potosi	21	Occidental	42
Bullion	5	Ophir	1.10
Caledonia	18	Overman	27
Cassidy	10	Potosi	35
Challenge Con	8	Savage	10
Chollar	5	Scorpion	2
Confidence	40	Seg. Belcher	9
Con. Imperial	2	Sierra Nevada	14
Con. Virginia	85	Silver Hill	3
Crown Point	42	Union	18
Exchequer	11	Utah	2
Gould & Curry	3	Yellow Jacket	27

(By courtesy of San Francisco Stock Exchange.)

OIL SHARES

San Francisco, December 1.

Alma	$ 1.00	Occidental	$ 15
Apollo	8	Palmer	1.50
Associated Oil	45.00	Paraffine	75
Bay City (New Stock)	50	Pinal	5.25
Brookshire	1.30	Premier	75
Caribou (New Stock)	1.15	Record	5.00
Claremont	1.40	Republic	50
De Luxe	1.25	Sauer Dough	1.90
Empire	2.75	Silver Tip	1.25
Enos	70	S. W. & B.	40
Fulton	1.25	Sterling	2.00
Illinois Crude	35	Turner	1.25
Jade	20	Wolverine	40
Monte Cristo	2.65	W. K. Oil	2.00
Nevada Midway	17	Yellowstone	15

(By courtesy of San Francisco Stock Exchange.)

CURRENT PRICES FOR CHEMICALS

(Corrected monthly by Braun-Knecht-Heimann Co.)

Prices quoted are for ordinary quantities in packages as specified. For round lots lower prices may be expected, while in smaller quantities advanced prices are ordinarily charged. Prices named are subject to fluctuation. Other conditions govern Mexican and foreign business.

	Min.	Max.
Acid, sulphuric, com'l, 66°, drums, 100 lb	$0.90	$1.25
Acid, sulphuric, com'l, 66°, carboy, 100 lb	1.00	1.50
Acid, sulphuric, C.P., 9-lb. bottle, bbl., lb	0.13	0.18
Acid, sulphuric, C.P., bulk, carboy, lb	0.09½	0.12
Acid, muriatic, com'l, carboy, 100 lb	1.60	2.00
Acid, muriatic, C.P., 6-lb. bottle, bbl., lb	0.15	0.20
Acid, muriatic, C.P., bulk, carboy, lb	0.10½	0.15
Acid, nitric, com'l, carboy, 100 lb	5.25	6.50
Acid, nitric, C.P., 7-lb. bottle, bbl., lb	0.16	0.22
Acid, nitric, C.P., bulk, carboy, lb	0.12½	0.15
Argols, ground, bbl., lb	0.20	0.25
Borax, cryst. and conc., bags, 100 lb	2.75	3.85
Borax, powdered, bbl., 100 lb	3.00	4.00
Borax glass, gd., 30 mesh, cases, 100 lb., tin lined	10.00	13.00
Bone ash, 60 to 80 mesh, bbl., 100 lb	4.50	5.50
Bromine, 1-lb. bottle, lb	0.55	0.65
Candles, adamantine, 12 oz., 40 sets to case	3.50	4.15
Candles, adamantine, 14 oz., 40 sets to case	4.00	4.55
Candles, Stearic, 12 oz., 40 sets to case	4.95	5.50
Candles, Stearic, 14 oz., 40 sets to case	4.65	5.20
Clay, fire, sack, 100 lb	1.50	2.00
Cyanide, 98 to 100%, 100-lb. case, lb	0.20¾	0.24¾
Cyanide, 98 to 100%, 200-lb. case, lb	0.20	0.24
Cyanide, 125 to 127%, 100-lb. case, lb	0.27½	0.28½
Cyanide, 125 to 127%, 200-lb. case, lb	0.26¾	0.27½
Lead acetate, brown, broken casks, 100 lb	8.75	9.00
Lead acetate, white, broken casks, 100 lb	10.00	10.25
Lead acetate, white, crystals, 100 lb	11.75	12.25
Lead, C.P., test., gran., 100 lb	13.00	15.00
Lead, C.P., sheet, 100 lb	15.00	18.00
Litharge, C.P., silver free, 100 lb	10.50	13.00
Litharge, com'l, 100 lb	7.50	9.00
Manganese ox., blk., dom. in bags, ton	20.00	25.00
Manganese ox., blk., Caucasian, in casks, ton. (85% MNO_2—¾% Fe)	45.00	50.00
Nitre, double ref'd, small cryst., bbl., 100 lb	7.00	8.00
Nitre, double ref'd, granular, bbl., 100 lb	6.50	7.50
Nitre, double ref'd, powdered, bbl., 100 lb	7.25	18.00
Potassium bicarbonate, cryst., 100 lb	12.00	15.00
Potassium carbonate, calcined, 100 lb	15.00	18.00
Potassium permanganate, drum, lb	0.11	0.12½
Silica, powdered, bags, lb	0.03	0.05
Soda, carbonate (ash), bbl., 100 lb	1.50	1.75
Soda, bicarbonate, bbl., 100 lb	2.00	2.50
Soda, caustic, ground, 98%, bbl., 100 lb	3.15	3.50
Soda, caustic, solid, 98%, bbl., 100 lb	2.65	2.85
Zinc shavings, 800 fine, bbl., 100 lb	11.00	12.00
Zinc sheet, No. 9—18 by 84, drum, 100 lb	10.00	11.00

CURRENT PRICES FOR ORES AND MINERALS

(Corrected monthly by Atkins, Kroll & Co.)

The prices are approximate, subject to fluctuation, and to variation according to quantity, quality, and delivery required. They are quoted, except as noted, f.o.b. San Francisco. Buying prices marked*.

	Min.	Max.
Antimony ore, 50%, per ton	*$20.00	$25.00
Arsenic, white, refined, per lb		0.03
Arsenic, red, refined, per lb	0.08	0.09
Asbestos, according to length and quality of fibre, per ton	100.00	350.00
Asbestos, lower grades, per ton	10.00	100.00
Asphaltum, refined, per ton	15.00	20.00
Barium carbonate, precipitated, per ton	42.50	45.00
Barium chloride, commercial, per ton	42.50	47.50
Barium sulphate (barytes), prepared, ton	20.00	30.00
Bismuth ore, 10% upward, per ton	*75.00	upward
Chrome ore, according to quality, per ton	10.00	15.00
China clay, per ton	15.00	20.00
Cobalt metal, refined, f.o.b. London, per lb	2.50	
Coke, foundry, per 2240 lb	15.00	17.50
Diamonds:		
Borts, according to size and quality, per carat	2.00	15.00
Carbons, according to size and quality, per carat	75.00	100.00
Feldspar, per ton	5.00	25.00
Firebrick:		
Bauxite, per M	175.00	200.00
Magnesite, per M	200.00	250.00
Silica, per M	47.50	
Flint pebbles for tube-mills, per 2240 lb	15.00	25.00
Fluorspar, per ton	10.00	15.00
Fullers earth, according to quality, per ton	20.00	30.00
Gilsonite, per ton	32.50	45.00
Graphite:		
Amorphous, per lb	0.01	0.02½
Crystalline, per lb	0.04	0.13
Gypsum, per ton	7.50	10.00
Infusorial earth, per ton	10.00	15.00
Magnesite, crude, per ton	7.50	10.00
Magnesite, dead calcined, per ton	22.50	27.50
Magnesite, brick (see firebrick).		
Manganese ore, oxide, crude, per ton	10.00	25.00
Manganese, prepared, according to quality, per ton	45.00	125.00
Mica, according to size and quality, per lb	0.05	0.30
Molybdenite, 95% MoS_2, per ton	400.00	500.00
Monazite sand (5% thoria), per ton	150.00	200.00
Nickel metal, refined, per lb	0.45	0.60
Ochre, extra strength, levigated, per lb	0.02½	0.03½
Platinum, native, crude, per oz	*20.00	25.00
Scheelite (see tungsten ore).		
Sulphur, crude, per ton	15.00	25.00
Talc, prepared, according to quality, per ton	20.00	50.00
Tin ore, 70%, per ton	*400.00	450.00
Tungsten ore, 65%, per ton	*475.00	520.00
Vanadium ore, 15%, per ton	*100.00	125.00
Wolframite (see tungsten ore).		
Zinc ore, 50% up, per ton	*15.00	20.00

AUSTRALIAN COPPER PRODUCTION

The following table, which shows the production of the four leading Australian copper companies in pounds, is taken from the *Boston News Bureau:*

	Mount Morgan.	Mount Lyell.	Great Cobar.	Great Fitzroy.
January	1,317,120	1,386,560	1,200,000	.....
February	1,256,640	1,391,040	1,200,000	.....
March	1,216,320	1,729,280	1,254,400	.....
April	1,355,200	1,585,920	1,211,840	362,880
May	1,337,280	1,393,280	1,218,560	347,200
June	1,305,920	1,500,800	1,128,960	304,640
July	1,223,040	1,460,480	1,458,240	4,401,600
August	595,840	1,404,480	1,386,560	452,480
September	1,226,720	1,308,160	1,276,000	436,800
October	1,514,240	1,225,280	1,942,080	427,840
Total	12,248,320	14,385,280	13,276,640	6,733,440

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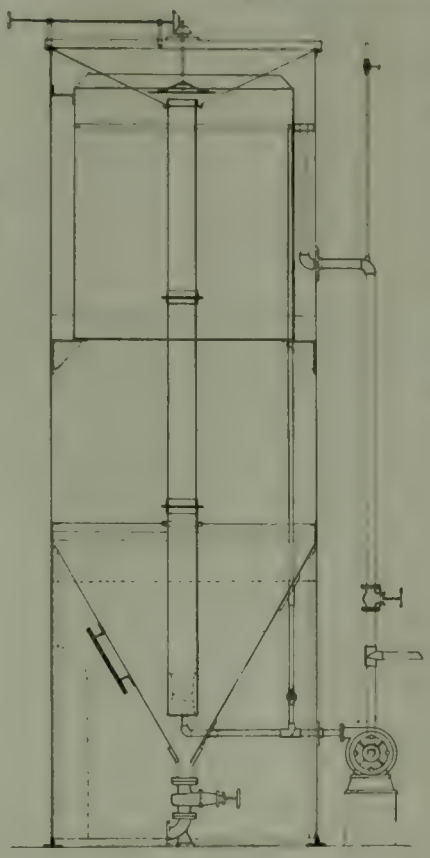

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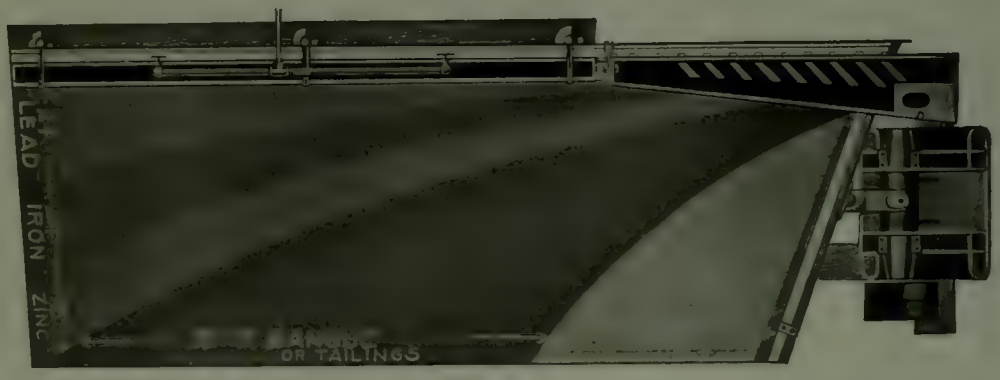

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EDITORIAL

MINNEAPOLIS is to entertain December 27 to 31, the American Association for the Advancement of Science, that wonderfully complex organization which meets annually to prove that vice-presidents are not negligible.

PORCUPINE is to have a railway at once, as Ontario authorities have passed an order in council authorizing construction of a line from Kelso and appropriating $450,000 for that purpose. In the meantime, the wagon road is reported to be in good condition and the eight mile tramp through the mud will soon be a thing of the past.

LOST HILLS is attracting much attention and an important addition to California oilfields is widely expected. Numerous strings of tools are working and the area will be thoroughly prospected. So far there is one producing well. It yields an excellent oil that finds ready local sale for fuel on other locations. This well is shallow, approximately 500 feet in depth, and it is suspected that the oil is from a minor body of sand in the shale, the true oil sand lying deeper.

RAILWAY managers smiled broadly when Mr. Louis D. Brandies maintained that better methods of operation would lead to such saving as to make higher rates unnecessary. They challenged him to make good his statement and he has accepted the challenge by offering to serve without pay while pointing out the economies needed. Any attentive reader of *The Engineering Magazine* in particular will need no great argument to convince him that Mr. Brandies has much with which to back his statement. What the Santa Fé officers have done in shop economy should surely be possible elsewhere, and why should it cost one railway four times as much to repair its locomotives as it does another? The railways are large institutions and however earnestly a manager may be working, he is a bold man who says another can not show him a better way.

COST DATA of considerable interest are contained in the annual report of the Nevada Consolidated Copper Company. The cost of direct mining, mostly by steam-shovels, was 15.4 cents per ton of ore, but to this must be added 15 cents for stripping redemption. Not only has it been necessary to strip the overburden from the ore, but a large amount of waste has had to be removed from around the rim of several of the great pits to safeguard the workmen at the bottom, which could not be done without giving the walls of the pits the

proper slope angle. Stripping has cost 47.6 cents per cubic yard, equivalent to 20.3 cents per ton. It is expected this will be reduced. The cost of concentration was about 61.7 cents and of smelting 59.3 cents per ton of ore. It is interesting to note that the smelting was all done in matting reverberatories. The blast-furnace was completed during the year but was not blown in.

ELSEWHERE in this issue will be found a translation, by Mr. W. H. Shockley, of an article which recently appeared in *Zoloto i Platina*, the quasi-official publication of the Russian gold and platinum producers. The subject of the translation is the 'Production of Ural and Siberian Dredges for 1909.' In the original publication the article was followed by a translation into Russian of an article by Mr. W. M. Knox on 'Less Known Dredges in California,' which appeared in the *Mining and Scientific Press* of July 2, 1910. It is gratifying to know that many of the technical articles published in the *Mining and Scientific Press* are translated and re-printed in *Zoloto i Platina*. In turn, the translation into English of an article from the Russian publication will undoubtedly be of interest and value to the many American and other English-speaking engineers now in Siberia and Russia.

IRON ORE receipts at lower Lake ports in 1910, to the end of October, amounted to 38,388,162 long tons, compared with 34,569,354 for the corresponding months in 1909. Of the total amount 82 per cent was unloaded at Lake Erie ports. The receipts at Gary, Indiana, show a curious decrease, and indicate that the new plant is slow in getting up speed. On another page we present a general review of the great Minnesota ranges that are now dominant as iron-ore producers. It is peculiarly appropriate that it should be written by a member of the faculty of the University of Minnesota, since that institution is owner of large areas of iron-ore land. It has in prospect from royalties so many millions as to cause officials of other Universities spasms of envy. With the money comes responsibility, and the University will not deserve its good fortune unless it use every effort to build up its mining school and in other ways give aid to the industry furnishing the funds. We are glad to know that a reorganization and enlargement of the geological department is now under way, and we hope the whole school of mines may be touched up. Minnesota deserves, and has the money to command, the services of the best men in the profession. A unique opportunity will be sacrificed if they be not secured.

DRILLING oil wells is a business concerning which technical literature has had little to say. In general, the work has been in charge of mechanics rather than engineers, and there are so many ways in which a driller can either help or hinder the work that the men have generally been given a free hand. Usually, too, when a field is under development speed is all-important. Competent drill-men have had neither time nor inclination to write of their work. In this issue Mr. W. R. Jewell tells something of the methods adopted in California and quotes representative costs. Detailed figures necessarily vary from point to point, and there are so many contingencies that accurate estimates can not always be made. It should be remembered that the drill crew works in the dark. It is impossible either to see the bit at work or to examine the hole when completed and determine just what was the difficulty. Among other notable things accomplished under these conditions, are the handling of a free-swinging column of eight-inch pipe half to three-quarters of a mile long; passing such a pipe to one side and around broken casing or tools in the bottom and continuing the hole; cementing off heavy flows of water nearly a mile below the surface; picking up from the bottom broken tools; underreaming so as to advance casing, and many other equally striking things. In California, wells have been completed where the pipe was broken and passed seven times, and yet a casing was landed successfully at the bottom. The technical achievements of the oil-men deserve more notice than they have received.

Conflicting Estimates of Ore Reserves

The Utah Consolidated Mining Company is the last big mine to get into trouble over ore reserves. The price of shares has dropped from $79, the high mark of January 1907, to $15, and profits per share from $9.45 in 1906 to $0.51 in 1909. Some of this decrease is properly chargeable to the lower prevailing price of metal, some to the necessity for dismantling the company's smelter, and some to the decrease in the metal content of the ore. The 296,989 tons mined in 1906, yielded at the rate of 62.4 pounds of copper per ton, with 1.6 ounces of silver and $2.87 of gold. In 1909 the corresponding figures were 35.8 copper, 1.07 silver, and $1.54 gold. These facts alone would be sufficient to depress the value of the shares. There is, however, the further matter of revising estimates of ore reserves. According to a statement issued by Mr. U. H. Broughton, president of the company, Mr. J. B. Risque, till recently the manager, estimated the reserve at 1,237,470 tons, early this year. This estimate was checked in February by Mr. J. W. Finch, who placed the amount at 1,121,360 tons. Since that date 130,000 tons has been mined. Mr. R. H. Channing, on his recent return to the property after an absence of a few years, questioned these figures, and Mr. C. C. Burger was employed to make a new examination. On the basis of reports by Mr. Channing and Mr. Burger the reserves are now placed at 300,000 tons averaging 2.32 per cent copper, $0.50 gold, and 0.85 ounce silver. From the large tonnage shown by mine maps and records to exist, but now inaccessible for inspection, it is estimated that 100,000 to 250,000 additional tons will be recovered. It is difficult to reconcile these conflicting estimates despite the high standing of the various engineers concerned. Evidently the principal difference is in opinion as to the amount that may be recovered from the workings not now accessible. The only evidence upon

which Mr Rospie Mr Finch and the others could base an opinion consisted necessarily of old maps and records some of which antedated Mr Rospie's administration. If they were inaccurate and untrustworthy former managers of the property are the ones at fault. If the data were accurate but were wrongly used, one or the other of the sets of examining engineers has made a serious mistake. Pending explanation by the men concerned it is well to suspend judgment, though the incident emphasizes anew the extreme danger of any engineer basing estimates upon figures furnished him by another.

Report of the Secretary of the Interior

Recommendations made by the Secretary of the Interior regarding proposed changes in laws relating to mineral lands, are summarized on another page. It will be noted that the Secretary neither favors nor anticipates extensive changes in the laws relating to lode and placer locations, except that he suggests that forty acres be made the maximum which may be acquired by any individual or association under the placer-land laws. This recommendation will meet with opposition. Under the modern scale of development more, rather than less, land is needed for each industrial unit. Forty acres would be too small an area to warrant building a modern dredge or driving one of the long cross-cuts necessary in drift mining. It would be better to change the terms under which land is given, if any change be desired, rather than so to disregard the practical conditions that must be met in conducting a modern industry. There may be a question why the Government should give land to anyone; but to apportion it in lots too small to be economically utilized, merely burdens the industry with expenses incident to consolidation of small holdings. Under existing conditions it means that the Government provides locators with the means of practically blackmailing those who would develop a large industry. Would it not be more businesslike to bargain directly with the men who are to conduct the enterprise and apply the profits to reduction of taxes paid by the 'poor prospector'? If it be felt that this does not sufficiently reward him, an old-age pension or a monthly stipend would probably answer, and the plan would have the advantage of letting each one know exactly what the true cost is. As it is, the 'poor prospector' is too often but the stalking-horse of those who would get something for nothing.

Other recommendations of the Secretary will meet with more general approval. His suggestion that more be appropriated for the National Parks in an effort to keep at home some of the money spent on foreign travel, his proposal that the smaller parks be given to the States, his recommendation that mineral location notices be filed in the nearest land office and a limit be set to the time that land may be held by assessment work, are all sound and should be adopted. The proposal to allow land cases to be taken to the Court of Appeals of the District of Columbia should be promptly enacted into law. Opposition among Western members of Congress who wish instead to allow appeal to Western courts is likely only to prevent any provision for court review. The District court may well come in time to be especially competent to handle such matters and there will be advantage in having cases tried at the capital where complete records are available. To insist on general review by Western courts indicates some fear as to the soundness of the cases to be tried. The reason for taking such matters into court is to secure judgment by men expert in the law and wholly disinterested. If it be wrong that the Department of the Interior should be judge, jury, and prosecutor, and we believe it is, what can be said for insistence that cases shall be appealed only to courts most likely to be influenced by local public opinion and custom?

The Secretary does not favor the leasing of public coal lands, except possibly in Alaska. He does, however, believe in leasing the remaining oil-bearing lands, and points to the success of the system in Oklahoma. He believes that the States should assume a large burden in connection with conservation measures and suggests that California make consumption of oil a public use and undertake the regulation of prices. This impresses us as a large order for California, and while we believe that the police power of the State must be used to curb monopoly, the law of supply and demand will always be potent. The United States as a large owner of oil and coal land has the power by stimulating or retarding development to directly influence supply, and so, price. If it be conceded that it is desirable to undertake regulation of price, why abandon the natural means of doing so? This year the peculiar combination of law and land office decisions has forced development at many points in California oilfields at a rate not warranted by the price of crude oil. Why should the United States withdraw land, thereby shutting off additional supplies of oil, and expect the State to use its police power to prevent the price from rising? Or, to present the reverse, why should land be thrown open to unlimited development and the State be expected to secure for producers a 'fair price'? Ownership of the land is the key to the situation. What good reason may be urged for opening the door, throwing the key down the well, and then expecting the police to keep out burglars? Not that all these arguments and inquiries follow from Mr. Ballinger's recommendation. They have force rather against those who would rely exclusively on the State's police power. The time may well come when it will be wise to make each State a trustee with control of all the public land in its borders, but for the present the power of the United States and of the States severally, is needed to control the situation. Unpopular as the proposal undoubtedly is in California, we believe that the plan for the Government itself to lease the oil land is sound, and as a present means of meeting the situation, should be adopted. We are glad to be in accord with the Secretary in this, though we would again suggest that the matter is one that may well be deferred until the present difficulties of the oil men have been met.

Production of Ural and Siberian Dredges for 1909

	Name of company.	Date of beginning	Date of closing.	Size of buckets, cubic feet	Days worked	Cubic yards excavated	Ounces of gold extracted	Average cu. yd. in cents (approx. value)	Remarks.
I.									
	1. Bogoslovsk Metallurgical Co.	April 30	Sept. 29	4.5	111	95,643	907	16.9	Built by the Neviansk Works, open-connected buckets.
II.	Moscow Forest Co.								
	2. Dredge No. 1	April 16	Nov. 3	3.0	173	182,372	1,601	15.6	
	3. Dredge No. 2	April 19	Sept. 29	5.5	160	238,381	1,187	8.9	
III.	Sosvinsk Gold & Platinum Co.								
	4. Dredge No. 1	June 18	Nov. 9	..	66	30,895	239	13.8	
IV.	Verk-Isesk Works (5)	March 15	Nov. 9	4.5	219.5	171,323	1,101	11.4	
V.	Heirs of P. P. Shuvaloff.								
	6. Dredge No. 1		Oct. 14	4.5	117	80,000	669	14.9	
	7. Dredge No. 2		Oct. 14	4.5	146	144,780	2,715	33.3	
VI.	Zaural Mg. Co.								
	8. Dredge No. 10—								Built by the Putiloff Works.
	Actionar claim	Aug. 14	Nov. 29	5.0	108	153,530	1,337	15.5	
	Danieloff claim	May 10	Aug. 14	5.0	95	153,962	998	11.5	
VII.	Neviansk Works.								
	9. Ermoloff			7.0	147	226,402	1,052	8.3	
	10. Neviansk			7.0	225	377,863	3,172	14.9	
	11. Konvaloff			7.0	184	268,197	1,393	9.2	
	12. Maria			4.0	86	83,730	366	7.7	
	13. Fedor von-Cruz			7.0	142.5	213,804	908	7.5	
VIII.	Nijni Tagil Works.								
	14. Dredge No. 1	April 21	Dec. 9	7.0	203	368,200	6,180	29.8	
	15. Dredge No. 2	April 21	Dec. 9	7.0	206	370,523	7,321	35.1	
IX.	Altai Gold Concessions.								
	16. Dredge No. 1	June 24	Oct. 15	3.0	114	107,970	573	9.4	Built by the Putiloff Works, 'Bucyrus' type.
X.	Alexandroff Gold Mg. Co.								
	17. Dredge No. 1	May 14	Nov. 2	5.0	161	150,945	2,560	30.2	
XI.	Borovinsk Gold Mg. Co.								
	18. Krestovosvijensk Dredge	May 13	Oct. 24	5.0	153	169,800	1,768	18.5	
	19. Mechta Dredge	May 8	Oct. 23	4.5	169	166,878	1,986	21.2	
XI.	Draga Gold Mg. Co.								
	20. Dredge No. 1	April 4	Oct. 23	4.5	190	161,036	1,159	12.8	
	21. Dredge No. 2	April 23	Oct. 31	4.5	174	178,892	1,706	16.9	
	22. Dredge No. 3	May 8	Nov. 1	4.5	33	31,140	230	13.0	
	Dredge No. 3				149	149,237	1,142	13.6	
XII.									
	23. Dredge No. 4	April 23	Nov. 2	6.0	172	240,093	1,865	13.8	

	24. Dredge No. 5—Prokopevsk claim	April	23	Nov.	2	7.0	51	61,785	427	12.3	
	Dredge No. 5—Innokentevsk claim	April	23	Nov.	2	7.0	42	52,272	511	17.4	
	Dredge No. 5—Alexander Co	April	23	Nov.	2	7.0	92	127,000	1,261	17.6	
XIII.	Saveleva & Sons.										
	25. Russalka Dredge—										
	Yeremievsk Claim	June	19	July	8	..	18	47,409	233	8.7	Built by the Korobeinikova Works in the Urals
	Pokrovsk Claim					..	170	153,162	1,992	25.0	New Zealand type
XIV.	A. A. Savinik.										
	26. Anglia Dredge	May	9	Oct.	31	7.0	155	199,771	1,665	14.8	Worked by shafts and hand labor
	27. Andrievsk claim					..	177	14,148	1,298		
	28. Maria Magdalen Claim					..	136	13,208	1,204		
XV.	Solomirskie & Heirs Turchaninova.										
	29. Staretel Dredge No. 1	June		Oct.		2.0	81.5	15,926	31	3.5	New Zealand type, built at the works of the company
XVI.	Spasski Co.										
	30. Spasski Claim	May	7	Oct.	24	5.0	163	167,753	1,429	15.2	
XVII.	Northern Yenesei Gold Mg. Co.										
	31. Viktorovsk Claim					..	245	213,449	2,163	18.0	
	32. Veniaminovsk Claim					..	31	50,165	486	17.2	
XVIII.	10. Uskova.										
	33. Dredge No. 1	May	1	Nov.	2	7.0	183	234,543	2,795	21.2	New Zealand type
XIX.	Fedorovsk Gold Mg. Co.										
	Southern Taiga—										
	34. Dredge No. 2					7.0	162	272,199	1,549	10.1	
	35. Dredge No. 3					7.0	180	268,160	1,988	13.2	
	36. Dredge No. 4					7.0	180	208,775	1,975	16.9	
	37. Dredge No. 6					7.0	154	167,246	1,003	10.7	
	Northern Taiga—										
	38. Dredge No. 7					5.0	143	75,235	1,207	28.2	Built by Werf. Conrad & Co
	39. Dredge No. 8					7.0	158	193,902	2,027	18.6	39-42 Built by the Nevianisk Works
	40. Dredge No. 9					7.0	157	196,926	1,975	17.8	
	41. Dredge No. 10					7.0	168	249,212	2,359	16.8	
	42. Dredge No. 11					7.0	159	208,240	3,063	28.1	
XX.	'Central Siberia' Marquis of Winchester.										
	43. Alexandrovsk Claim	May	22	Oct.	23	5.0	154	148,387	2,387	28.2	
	44. Narkizovsk Claim	June	25	Oct.	23	5.0	120	132,512	1,190	16.5	
XXI.	Novoudilsk Gold Mg. Co.										
	45. Dredge No. 1	June	14	Sept.	19	4.9	...	10,541	251	42.4	
XXII.	State Councilor P. V. Mordin.										
	46. Dredge No. 1					..	...	63,068	947	26.7	
	47. Dredge No. 2					..	...	20,320	329	28.8	
XXIII.	Amgunsk Gold Mg. Co.										
	48. Dredge No. 1	June	30	Oct.	14	.	106	35,255	1,113	56.2	
	Totals						6,731.5	8,116,166	82,993		
	Average for 1909, 41 dredges						164.18	186,939	1,811	17.2	The average for 1909 is based on 43 dredges be-
	Average for 1908, 48 dredges						149.54	166,410	1,434	15.3	cause of the whole number of 48 dredges 7
	Average for 1907, 46 dredges						137.74	139,274	1,141	14.4	dredges did not give complete returns
	Average for 1906, 32 dredges						173.0	159,588	1,346	15.0	

Production of Ural and Siberian Dredges for 1909

Translated by W. H. Shockley

*Following the example of last year, the Permanent Consulting Board of Gold and Platinum Producers has prepared statistics of the production of dredges in 1909. As dredging has been carried on in Russia for some ten years the present is a fitting time to sum up and explain the statistics, and to show the importance of dredging for gold and platinum mining in general, and to give some account of special districts. The editors hope in the near future to publish an article in which the above questions will be fully considered, and special attention will be given to important data, which have been collected by the Consulting Bureau with regard to the production of dredges during the last four years. The following short remarks give some explanation of the table, on pages 764-765, of production of the Ural and Siberian dredges for 1909. The questions sent out by the Consulting Bureau were answered by 23 operators, controlling 48 dredges. The following operators did not send returns:

1. The Platinum Company; no reason given.

2. Verkotursk company: because of liquidation (the dredge has been transferred to the Neviansk Works).

3. Teptiarsk Gold Mining Co.: on account of the stopping of dredging.

4. Putiloff Works: gave the same reason as the last.

5. Yenesei Gold Mining Co.: no explanation given.

The above owners control altogether seven dredges. In all there are registered 55 dredges. This is rather less than the number registered last year. This shortage of dredges is accounted for by the less number of dredges worked by the three large companies, namely, Draga; Fedorovsk; and the Neviansk Works. Comparison of the results of working during the last four years yields the following table:

	1906.	1907.	1908.	1909.
Average number of hours worked by one dredge	2,837.16	2,259.23	2,502.24	2,771.7
Average number of cubic yards of sand washed by one dredge	159,588	139,274	166,410	186,939
Average production of metal by one dredge, oz.	1,346	1,141	1,434	1,811

From the above table it follows that while the average excavation, for 1909 as compared with 1908, has increased 20,529 cu. yd., or 12.4%, the average production has increased 377 oz., or 26.2%. These figures show that the output of gold has increased twice as much as the increase in the amount of material treated. From this it may be concluded that the gold-dredging operators, taught by bitter experience, have worked richer ground. Actually the average content of gold for a cubic yard has increased to 17.8c. in 1909 as compared with 15.9c. in 1908. An output of 1810 oz. by one dredge should be enough to cover working expenses and amortization, and to allow some profit. The figures given above for the production of dredges for 1909 show that the dredging industry was unquestionably successful, both technically and economically. Following is a classification of the dredges according to the amount of gold produced:

Output.	Dredges.
Less than 527 oz.	6
From 527 to 790 oz.	2
" 790 " 1053 "	5
" 1053 " 1317 "	8
" 1317 " 1580 "	4
" 1580 " 1843 "	4
" 1843 " 2107 "	6
" 2107 " 2370 "	5
" 2370 " 2633 "	2
" 2633 " 2897 "	2
" 2897 " 3160 "	1
" 3160 " 3423 "	1
1 dredge gave gold and platinum 6180 oz.	1
1 dredge gave gold and platinum 7321 oz.	1
Total	48

*From 'Gold and Platinum (Zoloto i Platina)', No. 17, September 1910.

STANDARD OIL

The dividend of $10 per share for the last quarter of this year to be paid by Standard Oil Co. on December 15 will make total disbursements to shareholders from 1902 to 1910, inclusive, of $357,929,620. Standard Oil Co. within that period has paid more to shareholders than any other corporation in existence, although the U. S. Steel Corporation is paying more per year in dividends at present. The preferred and common dividends of the U. S. Steel Corporation amount to close to $51,000,000 per year, while Standard Oil Co. pays a trifle less than $40,000,000 per year. From 1881 to 1910, inclusive, Standard Oil Co. has paid out $710,000,000 in dividends and its total net profits during that period, with 1907, 1908, 1909, 1910 estimated, aggregated a total of $1,100,000,000, which, after payment of dividends, leaves a surplus of $420,000,000. Of this surplus more than $315,000,000 has been accumulated over the last nine years. This shows the great increased earning power of the Standard Oil during late years. The following shows net profits, dividends paid, and surplus after dividends of Standard Oil Co. from 1882 to 1910, inclusive, as compiled by the *Boston News Bureau*, earnings for 1907, 1908, 1909, and 1910 being estimated:

Year.	Profits.	Dividends.	After div. surplus.
*1910	$80,000,000	$39,335,320	$40,664,680
*1909	80,000,000	39,335,320	40,664,680
*1908	80,000,000	39,335,320	40,664,680
*1907	85,000,000	39,335,320	45,664,680
1906	83,122,251	39,335,320	43,786,931
1905	57,459,340	39,335,320	18,481,026
1904	61,670,110	35,188,266	26,481,844
1903	81,336,994	42,877,478	38,549,516
1902	64,608,363	43,851,976	20,761,407
Total	$273,302,064	$357,929,620	$315,272,444
1882-1901, inc.	456,240,000	351,883,000	104,407,000
Total	$1,129,442,000	$709,812,620	$119,679,441

*Estimated.

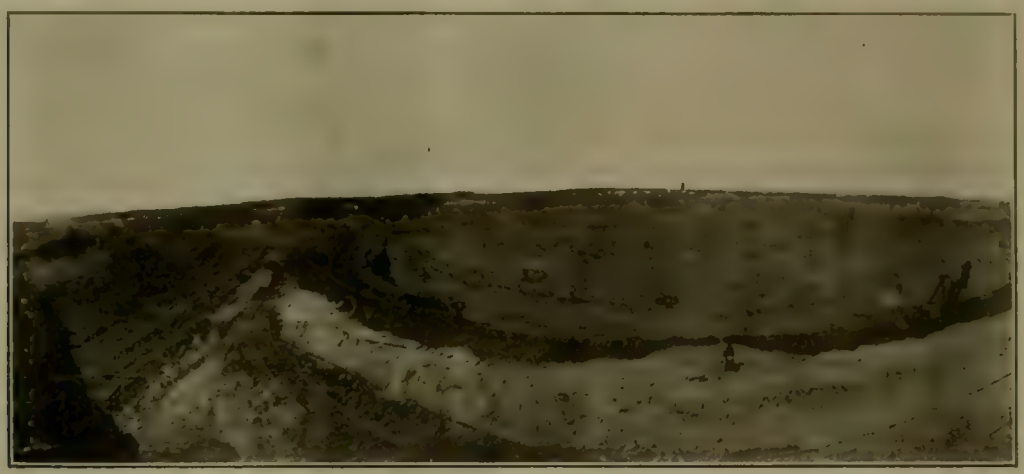
Iron Mining in Minnesota

By E. K. Soper

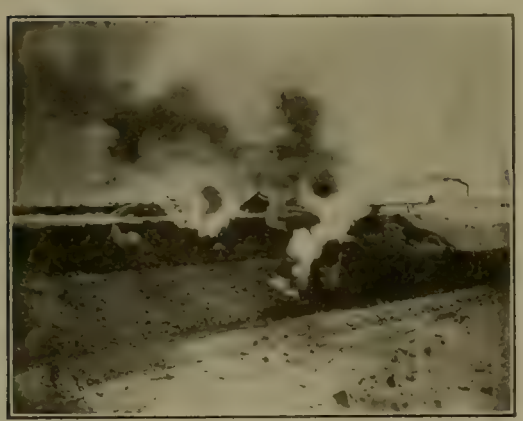
Modern science, coupled with skilled engineering practice, is constantly devising new methods and new machinery for harnessing the forces of nature and converting her resources into products useful to man. In this never ceasing advance, mining has more than kept the pace, and many deposits of the useful metals which ten or fifteen years ago were considered too low grade or refractory to be worked, are now being mined at a handsome profit, while the price of other metals has been reduced owing to the application of cheaper and better methods of mining and reduction of the ore. While the great majority of ores will always have to be mined by underground methods, it has been possible in the case of certain deposits, to apply a cheaper and quicker method of extraction, excavating in open pits with steam-shovels. This method is being used in mining certain iron and copper deposits, principally the former, where the ore lies at or near the surface and is easily broken.

The United States produces nearly twice as much iron ore as any other country in the world, and most of this comes from the Lake Superior region in Minnesota, Michigan, and Wisconsin. Minnesota is by far the most important producer of iron in the Union. St. Louis county alone produces three-fifths of the Minnesota ore, the shipments during 1909 amounting to 29,282,526 tons. There are two distinct producing districts or 'ranges' in northern Minnesota known as the Mesabi and Vermilion. From another, the Cuyuna, in Crow Wing county, about 100 miles west of Duluth, shipments have recently begun.

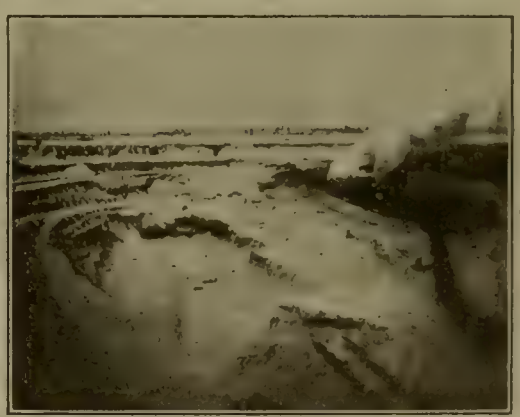
Mining on the Vermilion range, which marked the first iron mining in Minnesota, began in 1884 when the Soudan mine was opened near the town of Tower. Later the Ely district was opened. The region was reached by the Duluth & Iron Range railroad, which at first was built only as far as Tower, but was later extended a few miles beyond Ely. There are now six producing mines on the Vermilion range all controlled by the United States Steel Corporation and operating under the name of the Oliver Iron Mining Co. Up to the first of January 1910 these mines produced a total of 29,125,000 tons of iron ore. By far the most important of the Minnesota ranges is the Mesabi. The first ore from here was shipped from the Mountain Iron mine over the Duluth, Missabe & Northern railroad in 1892. That year the total shipments were 4248 tons. At present there are 92 producing properties on the Mesabi range from which during 1909 were extracted 28,174,000 tons. Since



Mahoning Mine, Hibbing, Minnesota. Showing Spiral Arrangement of Tracks.



Stripping at the Shenango Mine, Chisholm, Minnesota.



Stripping and Mining at the Same Time. Shenango Mine.

1892 the shipments from the Mesabi have amounted to the stupendous total of 195,700,000 tons of iron ore. Add to this the production of the Vermilion and there is a grand total of 224,825,000 tons sent to the smelters from Minnesota since the beginning of operations. Stated merely as a matter of figures, it is almost impossible to conceive what this means, but if all this ore were loaded and put into one train made up of cars of ordinary size holding 50 tons each, it would extend for 19,360 miles. If this train were arranged on the latitude line of St. Paul it would reach around the earth and have nearly 1700 miles to spare.

The Minnesota ores consist chiefly of the mineral hematite (Fe_2O_3), which contains theoretically, when pure, 70% iron and 30% oxygen. The orebodies of the two ranges are very dissimilar. In the Vermilion district they are quite narrow as a rule, and extend to considerable depths, usually standing at a high angle to the horizontal, while the ore is hard. This fact has necessitated the adoption of underground methods of mining. On the other hand, in the Mesabi district, the orebodies are beds from a few inches to 300 ft. thick, occupying broad, shallow troughs between quartzite and slate. The underlying rock is usually a hard iron-bearing chert called taconite, while the deposits are everywhere overlain by a thick mantle of glacial drift composed of material varying in size from fine sand to boulders weighing several tons. The ore is usually soft. Many theories have been advanced to explain the origin of the Mesabi deposits, but the one generally accepted by geologists is that the ores are due to the alteration of a rock composed of granules of green hydrated ferrous silicate called greenalite, which was originally laid down in a shallow sea as a sedimentary deposit. The alteration of this rock by percolating underground waters, caused a concentration of the iron and a removal of the silica from the original greenalite, and thus gradually, through geologic ages, the immensely rich deposits of iron ore were formed. The deposits have a lateral extent considerably greater than the vertical, and this fact makes possible in many cases the use of open-pit methods of mining. The thickness of the overlying glacial drift or 'surface,' as it is called, varies from 10 to 200 ft., with an average of about 100. This drift must all be removed and the surface of the clean ore exposed before actual mining may begin if steam-shovel work is to be adopted. Since the average property contains 40 acres, and many contain two or three 'forties,' it will be readily seen that the stripping from such an area of a thickness of 100 ft. of drift is a stupendous task. This is the chief disadvantage of the open-pit method of mining, for the interest on capital invested in preliminary plant and operations before a single ton of ore can be mined is sometimes prohibitive. Again, if there are ledges or horses of barren rock projecting into the ore, or if there are long narrow lenses and tongues of ore extending into the rock, open-pit mining is impracticable. Hence, many large mines throughout the entire district are being operated by underground methods, while some combine with the underground method, open-pit and milling systems. The nature of the deposit is determined beforehand by drilling holes through the ore at regular intervals over the area and from the results of this drilling, the size and shape of the deposit is estimated and the best and cheapest method of mining determined.

In stripping, it has been proved that it will pay to remove about two feet of overburden for every foot of ore. In other words, given a deposit of average grade, size, and shape, it will pay to strip off 100 ft. of glacial drift if ore 50 ft. thick can be thus obtained. Much of the stripping is done by contract at prices varying from 25 to 35c. per cubic yard. The stripping is loaded into dump cars holding about 7 cu. yd. and hauled to the dump, which must be situated on ground that is not underlain by ore. Also the dump must not be too far distant from the pit or the cost of hauling will be too great. The drift is hauled out of the pit in trains of from 6 to 12 cars, by 'dinkey' locomotives weighing from 12 to 25 tons. Lately, the stripping contractors have been using Baldwin or American locomotives weighing 50 tons, and no doubt the dinkeys will soon be entirely superseded by the larger locomotives. Sixty to eighty-pound steel rails, standard gauge, are used in all the pit work except where contract work on stripping is being done with dinkey locomotives, when 40 to 60-lb. rails on a 36-in. gauge are sometimes used. The steam-shovels in use are either of Bucyrus or Marion type. The one most in use is a 90-ton shovel with a 2½-cu. yd. dipper. These will average 35,000 cu. yd. of drift, or 50,000 tons of ore per month. In figuring the weight of ore and sand, it is estimated that 13 cu. ft. of ore of average grade will equal one ton, while 1 cu. yd. of sand is required to give the same weight. The ore is loaded directly into steel railroad cars of 50 tons capacity, which are brought into the pits by a system of switchbacks. The grades for the track vary as widely as do the shapes of the pits, but the minimum grade possible is always used. A ½ to 2% grade (average 1½%) is in use at the Hull-Rust mine at Hibbing, which is the largest iron mine in the world. This grade is perhaps a little below the average for the district and permits of hauling from the pit 10 to 12 cars of 50 tons capacity each, by one 90-ton locomotive, with the occasional use of a helper. In most of the mines, the usual number of cars hauled from the pits by one locomotive is six.

In classifying the ore for shipment, all ore above 49% iron by weight is considered of commercial grade. The arbitrary limits given below for separation of the ore into bessemer and non-bessemer grades are those used by the Oliver Iron Mining Co. during the summer of 1908 in making ore reserve estimates for the ensuing five years.

	Iron, per cent.	Phosphorus, per cent.	Silica, per cent.	Manganese, per cent.
Bessemer	61.55	0.052	4.65	1.59
Non-bessemer ...	57.20	0.099	7.15	1.04

The ore in front of the shovels is sampled frequently and thus classified and loaded into cars, according to the grade. The phosphorus and silica are as important in the classification as the iron content,

and ore that is high enough in iron to be graded as first class may be rendered second class on account of an excess of these elements.

Since the Mesabi range was opened there has been removed 125,000,000 cu. yd. of stripping. In 1909 the U. S. Steel Corporation handled 22,000,000 cu. yd. From the following figures it may be readily seen that the operations on the Mesabi, taking into account the removal of ore, are far more extensive than the work executed at the Panama Canal.

MESABI RANGE.

	Cubic yards.
Stripping in the operations, 1909	22,000,000
Estimated 71,000,000 tons of ore	19,730,000
Total material removed, 1909	19,730,000

PANAMA CANAL.

Total material removed during 1909	35,100,000

The above figures do not tell the whole story. In addition to all this work, it must be remembered that previous to mining, the land has to be thoroughly explored before any operations can be conducted. Drill-holes by the score have to be put down on each individual property of any size, and a large proportion never shows anything of value. The U. S. Steel Corporation spends yearly in Minnesota alone nearly $1,000,000 in exploration, most of which goes for drilling. In the period from 1910 to 1909 inclusive, this concern has put down drill-holes which have an aggregate length of 229 miles. Some of this work was done on the new Cuyuna range. There are few surface indications to guide the prospector. The covering of gravel has completely obliterated the outcrops of the iron-bearing formation. Scattered through this drift are pebbles of the iron formation, and these may serve as a rough guide at least in tracing the north boundary of the formation. Again, there seems to be a tendency for the larger orebodies to underlie surface depressions rather than elevations, but there are notable exceptions to this rule. For drilling, the property is usually surveyed into 100-ft. squares and a drill-hole put down on the corner of each square. The first holes are put down on adjacent corners, and unless ore is found, all of the corners are not drilled. Churn-drills are used in sinking through the drift and ore, while diamond-drills are used on hard rock or boulders. The drilling is usually done by contract, and there are several large exploration companies in the field ready to do this work. The contract price for drilling varies from $3 per foot in drift and ore to $6 per foot in rock.

Many of the mines are owned in fee by the State and many more by individuals or corporations, notable among the latter being the Great Northern railroad. The property is leased to the operators on the basis of a royalty of from 25c. to $1 per ton of ore mined, the higher figure representing some of the more recent leases. The aggregate tonnage of merchantable ore proved by exploration on the State properties alone is, according to the Tax Commission compilation, 137,495,000 tons. This will in time be the means of a large revenue for the State.

Three railroads tap the iron ranges of Minnesota. (1) Duluth & Iron Range; (2) Duluth, Missabe & Northern; (3) Great Northern. Mesabi ore is mined. The ore is transported to the docks at Lake Superior, where it is carried by boats to Lake Erie ports and South Chicago. The Duluth & Iron Range docks are situated at Two Harbors, Minnesota, and have a total storage capacity of 231,000 tons. The ore docks of the Duluth, Missabe & Northern are at Duluth with a capacity of 269,034 tons. The Great Northern docks are at Superior, Wisconsin, and the total capacity is 284,000 tons. Some of these docks represent a cost of about $1,000,000. There is a fleet of 150 boats on the Great Lakes which transports the ore to the Erie ports, where it is re-loaded into cars and shipped by rail to the furnaces to be converted into pig iron and later to finished iron and steel. The average ore-boat holds about 8,000 tons and is loaded in six hours. The newer boats which are being added to the fleet have a much greater capacity. The cost of these steamers varies from $200,000 to $500,000.

The importance of Minnesota as a producer of iron ore is fixed for many years. If the new Cuyuna range proves to be as rich in iron as is predicted for it, Minnesota will be in the enviable position of furnishing more iron than any entire nation in the world, except, of course, the United States. Recently work has been started on a $10,000,000 steel plant to be erected at West Duluth by the U. S. Steel Corporation, and in a few years Minnesota will be manufacturing steel out of the ore from its own mines.

UTAH COPPER CO.

The October production of the Utah Copper Co. was 7,582,219 lb., compared with 7,077,035 in September. The output last month represents an increase of 505,184 lb., or 7.1% over September, but a reduction of 14.5%, compared with the record output of 8,862,900 lb. last May.

The production by months in 1909 and 1910 was as follows:

	1910.	1909.
January	4,745,066	3,963,673
February	5,913,465	3,143,127
March	7,853,288	5,000,749
April	7,902,643	4,185,895
May	8,862,900	4,355,507
June	8,460,879	5,233,010
July	8,677,851	4,354,163
August	7,440,035	5,162,598
September	7,077,035	5,282,913
October	7,582,219	5,252,755
Total	74,515,381	46,434,380

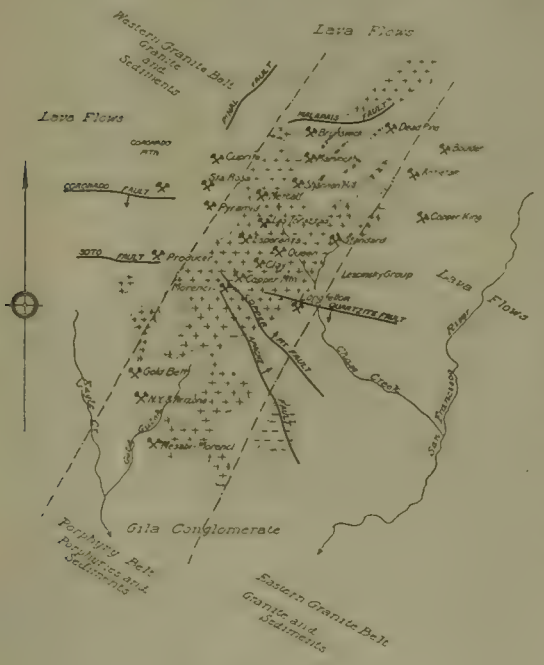
Superficial alteration of gold deposits and the migration of gold, take place at low temperatures, according to W. H. Emmons, who has recently studied the subject. At the very surface the temperatures range from 0 to 50° C., and pressures do not exceed one atmosphere. At the normal gradient of increase, the temperatures, even several thousand feet below water-level, would not exceed 100° C., and in the main are considerably lower. The general character and, approximately, the concentration of the solution are known from analyses of mine-waters.

The Clifton-Morenci District of Arizona—I

By William L. Tovote

Since the publication of the classic report on the copper deposits of the Clifton-Morenci district by Waldemar Lindgren, in 1905, the camp has developed in a quiet but steady way. It is to be regretted that it lies so far off the main traveled routes, for on account of its rather quiet progress it does not hold the professional eye like some other camps of no greater size or economic importance. This is the more unfortunate because the district affords interesting geological problems and here, too, are to be found, in places, new and up-to-date mining methods.

I. Geology.—Geologically Morenci presents much the same series of rocks that is found all over the Southwest. Of the pre-Cambrian crystalline schists but small remnants are found and these out-



The Morenci District.

side of the mining area proper. The sedimentary series is represented by the basal Cambrian conglomerate, followed by Cambrian quartzite, the Paleozoic limestones and shales, the sediments culminating in the Upper Carboniferous limestone. During a long continental period, from Carboniferous to Cretaceous, there is no positive proof of sedimentation. There was a period of uplift, however, for the Cretaceous series rests unconformably upon the Lower Carboniferous at Morenci, where the Upper Carboniferous is absent. However, the Cretaceous and the following Tertiary conglomerate, introducing the present continental period, have only a negative interest for the mining man, as the copper-bearing solutions did not penetrate into these rocks, and they only obscure the extension of the older sediments. Into this sedimentary series was intruded eruptive rocks, that may be divided roughly into three groups: first, the granite, of Cambrian or pre-Cambrian age; next, the porphyries and diabases, intruded in late Cretaceous or early Tertiary, initiating the ore deposition, and last—of no economic interest—intrusions and flows of rhyolites, andesites, and basalts, covering large areas and forming, with the Gila conglomerate, a wide circle, out of which rise the older formations, in which the mining is now carried on.

The productive area is not large. Allowing for some undeveloped prospects, the mineralized belt extends, perhaps, five miles in a southwesterly direction, with an average width of about two, but only a few hundred acres out of this large area form the source of the present copper output, which is from three main groups. The first is the central porphyry belt with its adjoining sedimentary blocks, where are situated Morenci, Metcalf, and Shannon, and farther north the Mammoth group. This is flanked on both sides by granite belts. That on the eastern side includes the second district in which are the Copper King, the Lezinsky group, Antietam, and Boulder mines, none of which is producing largely up to now. In the western granite belt occurs the Coronado mines, the Pyramid, Santa Rosa, and Cuprito groups, constituting the third great district. The whole area is cut by a complicated system of faulting, that breaks the Paleozoic sediments into blocks, which have been isolated by the settling of the surrounding country between and around the two upholding buttresses of massive granite which form the Coronado and Copper King mountains—two imposing peaks, that dominate the landscape, rising to 7500 ft. above the sea. The faults have been described in Mr. Lindgren's report, and hardly any new features have been developed since by the more extended mining operations. These faults, and the character of some of the rocks, that lend themselves easily to erosion, give the landscape its wild and rugged appearance. There is little doubt that the important metal of the camp, copper, is intimately connected with the occurrence of the porphyry injection, beginning with its intrusion and continuing for a long time, through the medium of ascending solutions, along cracks and fissures in the cooling magma and in the disturbed surrounding rocks. While the source of all the copper deposits is undoubtedly the same and the eruptions were essentially contemporaneous, even though covering a long time, the varied character of the rocks in which deposition took place, and other local conditions resulted in differences, so that there can be discerned four main groups of deposits, as follows, ranging them according to the sequence of their development to economic importance: 1. Metasomatic orebodies in the sedimentary series. 2. Porphyritic copper deposits. 3. Deposits along fault-planes accompanied by diabase intrusions. 4. Fissure veins in granite.

1. The metasomatic copper deposits in the sedimentary series gave life to the camp in the early days, when only the richest ore could be mined on account of the lack of cheap transportation. In

occurrence. These deposits resemble the Bisbee type only that they are perhaps more strictly typical for the "contact" variety of porphyry copper ores. This type of ore has been practically mined out today, with the great Longfellow cave and a few of the still accessible stopes near Metcalf as the former evidences around Morenci. Lessees are still following the ore in a few places along old stopes and in some outside boundaries, but the amount mined is diminishing year by year. Company work on these orebodies is limited to Shannon hill and the Mammoth group of the Arizona Copper Co. Ltd. The ore at the latter place is distinguished by the entire absence of copper carbonates, in place of which is found chrysocolla and copper pitch ores. The ore mined was and is entirely oxide ore, and all the known occurrences are near the surface. The economic minerals are native copper, cuprite, carbonates, chrysocolla, and brochantite, with here and there chalcocite and a few rarer minerals, mainly mixtures and combinations of copper, zinc, and iron salts. The shape of the orebodies is typical, roughly tabular, as in other metasomatic deposits with increasing vertical axes along or near intrusive dikes and fissures.

2. The porphyritic copper deposits exceed today by far every other group in economic importance in the district. A network of small fissures, occurring as lodes, or in zones of shattering and fracturing, contains chalcocite, the only mineral of economic importance for this group in Morenci proper. In and around Metcalf is mined some oxidized porphyritic ore. Here the chrysocolla is the most important mineral, carbonates and brochantite appearing in lesser degree. These oxidized ores are treated by leaching with sulphuric acid, as they are generally too poor for direct smelting, and defy concentration. The tenor of the ore treated is kept around 4% Cu where possible. Their commercial importance at present is not great, but might increase with improved methods of extraction. The chalcocite lodes are represented by numerous veinlets and a few stronger veins of roughly parallel course. The footwall is sometimes well defined, while at the hanging wall the lode usually grades into the surrounding porphyry. The terms foot and hanging wall are not well adapted for this type of deposit. The original mineralization appears to have been silicification and pyritization. The pyrite is slightly cupriferous. The chalcocitization is the result of secondary enrichment by descending surface waters. The mineralization is not limited to fissures and veinlets but penetrates the surrounding porphyry, analogous to stockwork deposits. The chalcocite envelops and penetrates the pyrite individuals and sometimes entirely replaces them in the veins, and it also penetrates the porphyry, replacing the feldspathic minerals either directly or by means of the substituted pyrite. The porphyry itself, in the vicinity of the lodes, is thoroughly altered, usually by kaolinization and serpentinization, to a soft, clayey aggregate of compact aluminous and magnesian minerals and quartz, that only roughly preserve the original structure. The porphyries vary from diorite and diorite-quartz-porphyry to quartz-monzonite and granite-porphyry with their intermediate varieties, grading by transition one into the other, all representing apparently differing phases of the same intrusion with differing magmatic segregation, caused probably by a difference in the basal rocks through which they worked their way. The diorite-porphyry variety is not considered an ore bearer in Morenci. While the lode type of vein is at present a dominant factor at Morenci, it is probably only of local character, limited by two converging faults, the quartzite or concentrator fault to the north, and the Copper Mountain fault to the south. The first runs nearly east-west with a turn to a more northerly direction toward its western end. The latter runs northwest. Outside of this block the lode system breaks up into a number of fairly well defined fissure-veins, so that, perhaps, an exceptional tension in this down-thrown block resulted in the breaking of the rock mass into a network of small veins, instead of a single fissure of large size. The source of the chalcocite is found in the upper part of the porphyry stock, and in the sedimentary blocks on top of it, that have since been eroded. Surface waters leached the copper from the sulphide ore, carried it in the form of sulphate, and re-deposited it farther down. This process is still going on. The upper part of the porphyry is leached out and appears at the surface as a cavernous silicious rock. The leached zone is, as a rule, about 150 ft. thick, thicker than in most other porphyritic copper camps. The underlying zone of enrichment is usually 200 to 250 ft. thick, increasing in places to about 500 ft., wherever proximity of faults or the intersection of lodes facilitated circulation and re-deposition. The width of the workable ore in the central part of Copper mountain, where the main lodes converge and intersect each other, near the Copper Mountain fault, is about 500 ft. At the lower end the chalcocite zone changes rather abruptly into cupriferous pyrite of no present economic value. The pyrite is, as a rule, more sharply confined to veinlets and sometimes is accompanied by vein quartz. The question whether the known chalcocite zone is the only workable deposit in the porphyry stock at Morenci proper, is a rather vital one, as parts of the camp have been so thoroughly prospected that the limitations of the probable ore are quite well defined. There have been, of course, recent discoveries of ore both vertically and laterally, thus extending the possibilities surprisingly, but, as a whole, the district shows its limitations. Mr. Lindgren rather discouraged the hopes of some of the local mining men as to the probability of a second workable zone below the pyrite that occurs at the lower limit of the chalcocite deposition, and the reasons for his conclusion are strong. I wish, however, to call attention to a few facts, that might, perhaps, lead to a more thorough discussion of this question by economic geologists and decide whether the still cherished belief of many a Morenci miner is hopeless. In the first place, the level of permanent groundwater has nowhere been reached in any of the workings of the district, so we here are still

in the dark as to the character of the deposits at that important level—whether they change into normal chalcopyrite, zincblende, and pyrite veins or not, and if so, whether they are of economic value. Furthermore, there is pyrite on top of the chalcocite zone as well as below it. True, the pyrite on top shows more evidence of leaching than that at the bottom, the latter appearing relatively fresh, but even this has undergone alteration, as indicated locally by nearly obliterated crystalline aggregates of a habit decidedly not pyritic. But I do not dare to pronounce them as formerly chalcopyrite, on the strength of the material itself. A last consideration, that appears to me most important, is the zinc problem. According to analyses published in Mr. Lindgren's report, the fresh porphyry contains a noticeable quantity of zinc—0.3% ZnS compared with 0.2% Cu_2S. The old workings show frequently efflorescences of goslarite (hydrous-zinc sulphate), but the bulk of the original zinc has disappeared to beyond the limits of present development, if I except an outlying prospect, the Producer group, the singular occurrence of the Joy blanket vein, in the Humboldt mine, and the Lone Star mine, where the present deepest workings disclosed a well-defined streak of sphalerite below the chalcocite zone. Is there not a possibility that the Morenci deposits may change from copper to zinc with increasing depth? And is it not possible that there may be found here an analogy to the limestone deposits of the Mississippi Valley, with their duplicated series of lead-zinc-iron? Of course, if there should be a second copper horizon below the chalcocite, I look for chalcopyrite as the copper mineral, and for veins, not for stockwerk-like impregnations.

3. Deposits along fault-planes accompanied by diabase intrusions. This group has recently come more and more into prominence. Its oldest and best known example is the great Coronado vein. It follows a fault-plane running east-west, on the south slope of Coronado mountain. The wide fault-zone is partly filled with crushed and kaolinized material mostly derived from the granite north wall, and is followed by an irregular diabase dike. This fault-vein has been worked for three miles with an average width of about 60 ft., while locally it expands to upward of 100 ft. wide. To the west it disappears under lava-flows, while to the east its extension is not yet established beyond a doubt, but it seems to cross a zone of stress, or weakness, a few hundred feet east of the Coronado main shaft and to split into several branches. One branch seems to pass down Coronado gulch and straight across into Metcalf hill, where it is, perhaps, connected with the ore deposition there. Other branches take a more northerly and northeasterly course and wind around the east slope of Coronado mountain, possibly connecting with some of the faults and veins, that are being exposed in the Santa Rosa group of the Detroit Copper Co. The Coronado vein is opened from its main shaft down to the 100-ft. adit level, a barren zone separating it from the oxidized ore. The character of the sulphide ore is the same as in the porphyritic ore, chalcocite encasing and replacing pyrite in kaolinized and serpentinized gangue material. The accompanying diabase, the intrusion of which Mr. Lindgren places slightly later than the porphyry eruption, forms an irregular dike, widening and thinning from point to point. It is generally much altered. Where found relatively fresh it appears as plagioclase and a dark-green pyroxene, perhaps diallage, with pronounced cleavage, with pyrite in grains and as a coating on fissure-planes. Mr. Lindgren did not believe that the diabase was intimately connected with the ore deposition, but the frequent recurrence of the same combination, as has been disclosed since, might perhaps change his idea. In the vicinity of the Coronado vein are several smaller diabase dikes that show encouraging superficial prospects. Diabase occurs, too, somewhere in the Santa Rosa group as indicated by float, but its connection with copper deposits has as yet not been proved there. Diabase rises along the quartzite fault in Morenci, where the Yankie lode joins and follows this fault, assuming its dip to the south, and forming the seat of operations for the Yankie and Longfellow mines. Diabase accompanies the Brunswick vein at Garfield, north of Metcalf, and appears in the Boulder mine, and the Dead Pine group, of the Arizona Copper Co., where recently a large body of high-grade sulphide ore has been developed, and also in the Antietam mine of the New England & Arizona Copper Co., which, perhaps, is an extension of the former, in the northeast end of the district. Indeed, the diabase is found in nearly all parts of the district and is of special interest, as the enriched zone has been proved in some of these mines to be of greater vertical depth than anywhere else in the district and deep mining seems to be assured here at least.

4. Fissure veins in granite. This group has not yet attained great economic importance, the properties, where this type of veins appears being still more or less in the stage of prospects. But one of them, the Pyramid mine of the Arizona Copper Co., near the foot of the Coronado incline, has had a good deal of development and is a fair example for this type. The original mineral seems to have been chalcopyrite instead of cupriferous pyrite, as it appears intimately mixed with chalcocite in the zone of enrichment. Besides this mixture is found a pure chalcocite. Local enrichment seems closely connected with cross-fissuring. Other examples of this type are some prospects of the Lezinsky group of claims on the west slope of Markeen (Copper King) mountain and those of the Cuprite Mining Co., in the north end of the district. The Santa Rosa group of the Detroit Copper Co., that bids fair to become one of the great producers of the camp, will most likely furnish other examples. As a mineralogical curiosity native copper occurs replacing the feldspar of the granite in this locality.

In concluding this geological sketch I may mention the Standard Copper Co. that works flat veins, near the contact of porphyry and granite; the Copper King mine, that went down 900 ft. on a fissure in granite, following a porphyry dike, which workings are on a highly silicious copper ore carrying

gold, and three new companies, namely the Gold Belt New York Arizona and Mesabi Mohawk Mining companies that are developing a series of fissure veins in the southwest end of the district in which the economic mineral is gold. These veins probably furnished the material for the placer gold that gave rise to a short-lived gold excitement in the early days of the camp. These are in and around Gold gulch, a tributary of Eagle creek.

DISCOVERY OF THE GOLD ROAD MINE

By J. C. Kennedy

One of the strange things connected with the mining industry is that some of the lodes which have developed into the most prominent mines have been discovered by accident, and sometimes by those who were not seeking veins. Probably a still larger number of bonanza, or dividend paying veins have been discovered by ignorant, listless, often dissolute persons, who in a desultory way were prospecting while hundreds of intelligent, earnest, energetic prospectors have toiled through winter's cold and summer's heat all their lives, suffering hardships and privations, and have finally 'passed over the Great Divide' without making their 'stake' on the hither side. The story of the discovery of the Gold Road mine northwest of Kingman, Arizona, which, so far as I know, has not been published, is of interest.

The Gold Road quartz lode is a remarkable one. It outcrops boldly and nearly vertically in a straight line for 3000 ft., being 18 ft. or more in width, and in places standing above the surface 75 ft. on one side and 40 ft. on the other. It is in plain view of the old overland road from Santa Fé, New Mexico, to San Bernardino, California, which was opened by Lieut. Beale as early as 1850. Hundreds of prospectors and others passed by this prominent reef in the fifty-odd years subsequent to the opening of the road, without discovering the auriferous character of the outcrop. Perhaps one reason why it did not attract the attention of prospectors was its great size and the white, unstained, onyx-like appearance of the quartz. In 1902 or thereabouts, a local character in Kingman was known as 'Mexican Joe,' whose family name is not recalled. He had previously done a little prospecting in a vagrant sort of way. When in town, so long as he could beg or borrow a peso he devoted most of his time to drink and three-card monte. When away from town he spent most of his time rolling cigarettes and hunting his burros. He had been on a spree in town ending in a fine case of delirium tremens. Henry Lovin, the sheriff of Mohave county, put him in jail ostensibly on a charge of vagrancy, but really to sober him. He was a long time sobering up, however, and during most of the time he consumed the county provisions with regularity and alarming voracity. Mexican Joe finally yearned for freedom and proposed to the sheriff that if he would furnish him with a 'grub-stake' he would leave town and find a mine for the sheriff and himself. The sheriff, mindful of the county's exchequer, or of his own future political prospects, considered it cheaper to go down in his pocket for the 'grub-stake' than to board his prisoner longer at the county jail. Joe was accordingly provided with about $10 worth of supplies and started with his burros for Willow Springs, situated about three miles from the present Gold Road mine. Joe, however, was born tired and was sick, or thought he was, so he did no prospecting, but stayed at the spring until his supplies were nearly exhausted when it occurred to him that it would be wise to return to town and 'work' the sheriff for another 'grub stake.' As usual in such cases the burros were missing. He finally found them in a saddle like depression on the apex of the huge quartz vein previously mentioned. Climbing up to the animals he dislodged a piece of quartz which he noticed was plentifully filled with native gold. A brief search revealed more of the same exciting material. He thereupon located three claims for himself and Lovin, two of them being named respectively the Gold Road and Billy Bryan. He then hastened to Kingman, where he quickly became the centre of interest, and an important personage. The two partners shipped $3000 worth of ore from three 10-ft. shafts on the claims, and not long afterward sold the claims to Mr. Burkhardt, of Los Angeles, California, for $50,000. The Mexican devoted his share of the sale to mescal and monte, and this ends his story. Lovin's share made the basis of his fortune.

Mr. Burkhardt sold to Baily & Posey for $100,000. Six months later Mr. Posey sold a one-third interest to Clarence McCormick for $100,000. A company was then organized and 52% of the stock was sold to a French syndicate for $500,000. Finally the mine came under the present control. It is now being worked by modern methods, and has a large medium-grade orebody from which the company expects to derive substantial dividends for many years to come.

EUROPEAN COPPER CONSUMPTION

According to James Lewis & Son of Liverpool the consumption of copper in Europe for the ten months ended October 31 (except in Germany where the figures are for nine months), amounted to 617,238,720 lb., an increase of 73,225,600, or 13%, over the corresponding period of 1909; 36,220,800, or 6%, over 1908; and 166,904,640, or 37%, over 1907. The European copper consumption for the first ten months of 1910 compares with the two previous years as follows (in pounds):

	1910.	1909.	1908.
England	168,902,720	125,865,600	149,607,360
France	113,167,040	107,392,320	118,746,880
Germany (9 months)	275,404,480	257,510,400	260,202,880
Other European countries	60,764,480	53,244,800	52,460,800
Total	617,238,720	544,013,120	581,017,920

Copper deposits are among the most widely distributed in Japan. They are well distributed over Honshu, Shikoku, and Kyushu, while in Formosa and Hokkaido a few scattered deposits also occur. The four important classes present are beds, metasomatic deposits, contact, metamorphic deposits, and veins. Copper has been mined in Japan for 1200 years. In 1908 the output amounted to 40,441 long tons, valued at $11,471,325.

NICARAGUAN MINING CONDITIONS

Changes in government in Nicaragua consequent on the success of the recent revolution, have attracted renewed attention to the opportunities for mining in that country. There is already an established gold-mining industry and numerous properties have been examined in behalf of American in-

Indians Polling a Pitpan on the Piz-Piz River.

vestors. Something of the present difficulty of working in this country is indicated in the figure above showing the transportation of material in Indian canoes. The possibilities of economical operation are, however, suggested by the second picture, showing the Siempre Viva falls. With a stable government and more numerous railroads the min-

Siempre Viva Falls and Power Station.

ing industry should greatly expand. It is said that the Lone Star mine was sold for $300,000, and other mines that have been under option were rejected less because of any doubt as to the value of the property than because of the unstable political conditions at the time examination was made. The new president of the republic is known to favor the introduction of foreign capital and the local feeling is that a period of active exploration and development is opening.

There are numerous opportunities for investment in mining enterprises in Nicaragua, and such investments would undoubtedly be profitable, if the difficulties of transportation were solved. The main trouble is that no one of these mining properties offers sufficient inducement to justify large expense in affording cheap transportation, such as the building of a railroad, but even this will, in time, no doubt, be accomplished.

STOCKWORKS

By J. H. Collins

*There are irregular masses, belts, or zones of 'country' rock that are traversed by numerous thin veins, or which have their numerous joints thinly lined, or that are sprinkled throughout with small spots of metalliferous substance, the whole mass being thus rendered of considerable value. An ore mass of this character is called by the Germans a 'stock,' and a working upon such a mass a 'stockwerk,' or as the term has been adopted in England, a 'stockwork.' Such open workings, whether upon true stocks or upon the branching outcrops of lodes, were in Cornwall formerly called 'coffins' or 'goffans,' while large underground excavations of a similar character are called 'gunnises' or 'gunnies.'

Since the individual strings of mineral are usually insignificant, it is necessary in stockwork mining to remove the whole mass of impregnated rock and to treat at any rate the greater portion in order to concentrate and separate its valuable contents. As the ores so distributed are often very small in quantity compared with the whole mass of the rock, for example with copper ores 1% or less and with tin ores 3 to 10 lb. of tin oxide per ton, a concurrence of favorable circumstances is necessary to enable them to be worked with profit—such as cheap labor; land of little agricultural value on which to deposit the refuse; a good outlet for the said refuse so as to keep the workings clear; a good supply of water for concentration purposes, and, if possible, water-power for crushing; a body of the impregnated rock so large as to permit of working on a considerable scale; a genial climate allowing work to be carried on without serious interruption, etc. Even with all these advantages many deposits are so poor that they remain unworked, and few will pay to work except as open quarries.

Stockworks in the west of England have only been worked for tin or copper. Tin stockworks have been worked in granite and several of its modifications, as greisen, schorlyte, and carclazyte, also in several kinds of feldspar-porphyry (elvan); they have also been worked in ordinary killas, and in that modification of this rock known as tourmaline schist. Copper stockworks have been worked in granite, in elvan, and in killas. Few of these stockworks are distinctly associated with ordinary lodes, and even when they are so associated there are indications pointing to a notable difference of date, the lodes being of subsequent origin to the mineralized ground. The chief individual strings are usually steeply inclined or even vertical, and, as will be shown hereafter, these strings contain a notable proportion of the whole mineral content of the belt, and nearly the whole of that which is extracted or extractable by the simple methods in use, and which are nevertheless in most cases the only ones economically possible. The granite in which disseminated tin ore occurs is almost invariably altered into greisen, schorlyte, carclazyte, or zwitter.

*Abstract from 'Ore Deposits of West of England,' now being prepared.

Oil-Well Drilling in California

By William R. Dowell

Within the past ten years the oil business has grown to such proportions that at the present time it constitutes one of the greatest sources of wealth in California. With its development and as a consequence thereof have arisen many important questions and problems financial, political and technical. Of all the activities throughout the oil fields well drilling is of first importance. No matter how great may be the merit of an oil property, poor results and probable failure, will follow if drilling is not intelligently prosecuted. Drilling for oil is a business, which when resolved into the many problems attending it, is seen to be something more than the mere drilling of a blind hole to an indefinite depth into the earth. Dependent at the outset on situation, depth of formation, knowledge of the strata, position of water-sands and oil-sands, it is at best uncertain in its result. But the conditions enumerated being known, the most suitable method of drilling for the particular case may be selected, and barring more than the average run of mishaps, the cost of drilling may be approximately estimated.

Selecting the site for a well in unexplored territory is a very important matter, and in all cases the services of a competent geologist should be secured. I have seen wells drilled on the eroded crest of an anticline which got nothing, while wells drilled on the same quarter-section of land, but on the flanks of the same anticline, obtained commercial quantities of oil. This is especially true in the fields of the San Joaquin valley, where the formation is frequently and closely folded. In addition to determining the most advantageous position for a well, the geologist will be able to furnish useful data as to the depth at which the various strata will be penetrated. The selection of a point at which to drill in a proved field is comparatively simple and is largely a question of judgment after consulting the logs of neighboring wells. From comparison of these logs, the depth of certain strata in any part of the tract to be drilled, can usually be closely estimated; and the formation being known, the kind of drilling rig best adapted to meet the conditions, can be provided. For prospecting in territory expected to be less than 1000 or 1200 ft. deep, portable rigs are frequently used. These are of the Keystone and Star type. This sort of rig is inadequate for the handling of heavy casing, and is therefore impracticable for drilling to a greater depth, or where it is expected to finish a well for the pump. Rotary drilling, as the name implies, consists of advancing the hole by boring, instead of by percussion. This is effected through the agency of a two-blade, fan-shaped bit, known in the oilfields as a 'fish-tail' bit. The shank of this bit screws by means of machined threads into a 'tool-joint' which is from 18 to 24 in. long. This tool-joint in turn screws into the 4-in. or 6-in. drill-pipe which is the rotating shaft for the bit, and is from ¼ to ½ in. thick. These two joints are used to form the connection between the drilling bit and the drill-pipe and between every fourth joint of the drill-pipe being especially designed to withstand the wear and tear of frequent jointing and unjointing which otherwise would soon strip the threads from the drill-pipe. When the well is at depth and it becomes necessary to change the bit (which is frequently), the pipe and bit are pulled up by means of machinery into the 100-ft. derrick and the tubing disconnected at the tool-joints. In drilling, water is continuously forced down the drill-pipe and ejected through two apertures in the drill-shank. This not only furnishes drilling water, but the erosive effect of the two jets of water from the drill-shank is considerable, and aids in cutting the hole. The water flows up and out of the well, carrying with it the drillings. The process of drilling by means of the standard or cable-rig consists of churning by means of a heavy drill suspended by rope or cable from the end of a 26-ft. walking-beam. This method of drilling possesses the disadvantage of having to pull the drill at intervals to remove the drillings.

Where the formation contains many boulders, 'shell', and other hard matter, the standard drilling rig is better suited to the work than the rotary drill. In shale, sand, and clay, where there are not many boulders, the rotary will do the better work. The McKittrick and Coalinga fields offer two types for illustration. The first 1000 ft. of the formation in the McKittrick field includes many granite boulders. Therefore the standard rig is best. In the Coalinga field, however, the best progress is made by drilling the first 2000 ft. with rotary and then changing to the standard. The Creme Petroleum Co., on Sec. 30, T. 20, R. 15, Coalinga field, put down the first 2020 ft. of its well No. 1 with a rotary drill in 35 days. At 2000 ft. a hard formation was encountered and five days were consumed in penetrating 20 ft. of it. The rotary was then moved to a new site and well No. 2 begun. A standard rig was set up to complete No. 1, and this drilled through the hard ground at the rate of 20 ft. per day. A combination standard-rotary drilling rig is now being evolved, which when perfected will consist of both types of drill, so arranged that one may be interchanged with the other with little loss of time. At present there are combination rigs in use, but much valuable time is lost in rigging up for the cable-tools. With the advent of electricity throughout the California oilfields and the perfection of the motor, drilling will hereafter be done largely by that power. Electricity is being successfully used in drilling in the East. Aside from mechanical advantages, it will do away with the cost of fuel and water.

The size of hole to be drilled in starting a well, depends entirely upon the depth to which the well is to be sunk. In a field where the depth to the petroliferous formation is known, a hole of a diameter consistent with that depth is started, and the well can be drilled at a minimum cost. But in drilling in an unexplored field it is safest, and generally the most economical eventually, to start with the

largest size casing, maintaining that size to as great a depth as possible before reducing to the next smaller size. This method permits of driving a well to the greatest possible depth. It has become a very important feature in modern oil-well drilling to shut out all water above the oil-sand. Formerly this was not done, with the baneful result that certain of the older fields today find their oil-wells 'going to water', their oil-sands impregnated to a considerable, and expensive degree with water. Such a condition of affairs will not only ruin developed property, but also render adjacent undeveloped oil land practically unfit to be drilled. Cementing off the water in a well is an expert operation which consists of forcing from a few tons up to as much as 25 tons of concrete firmly about the lower casing, inside and out, at the base of the water sand, and above the oil-sand. The concrete is allowed to set for three weeks before it is drilled through with a smaller size bit. The oil-sand may then be safely entered, and drilled, with all water above completely shut off. The final joint of casing is 'landed,' superfluous casing is removed and saved, all of the casing within the oil-sand is perforated, and the well is ready for the pump.

The following figures may be taken as making up the absolute first cost in the preparation to drill by means of a standard drilling rig.

COST OF RIG

Lumber for rig	$720	
Construction	180	
Cartage	150	
Rig irons	750	
Total		$1,800

BOILER, ENGINE, AND FITTINGS

Boiler, 40 hp	$450	
Engine	330	
Fittings	350	
Total		1,130

TOOLS

Drills, pulleys, accessories		1,600

CABLE LINE, ETC.

Manila line, 2½ in., 1500 ft	$400	
Sand line, wire cable, 9/16 in., 2000 ft.	80	
Cable, ⅞ in.	430	
Total		910
Total cost of materials		$5,440

The above figures must be taken into account before drilling can be commenced. In planning to drill, say 2000 ft., casing should be provided as follows:

CASING

300 ft., 13½ in.	$900	
1,000 ft., 11⅝ in.	2,000	
1,600 ft., 9⅝ in.	2,800	
2,000 ft., 7⅝ in.	2,000	
Total		$7,700
In many cases it will be necessary to shut off water; the total cost of which is		600
Total casing and cementing	$8,300	$8,300
Total cost material		$13,740

Of the above casing, there may be withdrawn and saved

Ft.	Size, inches.	Value.
300	13½	$900
1,000	11⅝	2,000
1,500	7⅝	1,500
Total		$4,400

The cost of the well may be credited this full amount if a second well is contemplated and it is found that this casing can be used to advantage therein. For a complete estimate of the cost of the 2000-ft. well, there must be added to the original cost of material, the cost of labor, fuel, and water. These three items depend upon the time consumed in drilling the well. In the California fields it takes from 100 to 150 days, and often longer, to drill to a depth of 2000 ft. The latter figure should be used in estimating.

COST OF LABOR

Two drillers per day	$16	
Two tool dressers	8	
Roustabout and team	7	
Total labor per day		$31

FUEL, WATER, AND LUBRICANTS

Fuel, 10 bbl. crude oil per day	$6.00	
Water	2.50	
Gasoline (for lights), lubricants, etc.	1.50	
Total		$10
Total cost, labor, fuel, water, etc., per day		$41
For 150 days this would amount to		$6,150

The well having been successfully drilled, a pump, tubing, pump rods, etc., must be installed. These will cost:

PUMP AND ACCESSORIES

2,000 ft. of 3-in. tubing	$700	
2,000 ft. of rods	200	
Pump, barrel, etc	75	
Total		975
The completed well would cost		$20,865

The essential points to be observed in oil-well drilling are: first, determine as nearly as possible what may be expected as to depth, and the character of formation; second, select the drilling rig best adapted to these conditions; third, employ reliable and competent drillers; fourth, cement off all water from the oil-sand.

Zinc dust made in America has only recently come into the market for precipitation from cyanide solutions. The dust from American plants has been manufactured as a by-product in smelting and generally contained too much zinc oxide. The dust imported from Germany is made primarily for use in the dying industry and every effort is made to keep it free from oxide. A small amount of lead is helpful rather than the reverse. Recent sales have been with a guarantee of 92% metallic zinc. The oxide present not only reduces the efficiency of the material and adds to the cost, but occupies valuable space in precipitation presses.

Discussion

Readers of the Mining and Scientific Press are invited to use this department for the discussion of matters pertaining to [illegible] We [illegible] following [illegible] its publication [illegible]

Concentration of Slime

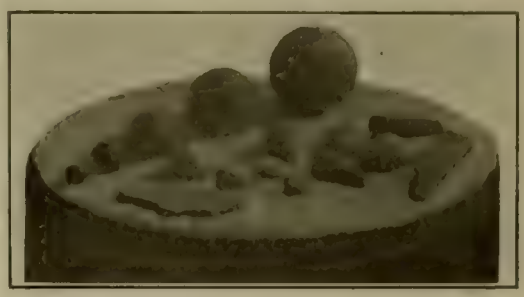
The Editor:

Sir: In the first part of E. A. Sperry's paper on the above subject [illegible] Scientific Press, August 6, 1910, he devotes considerable space to the different machines in use for pulverizing ore, and their action, and makes a few remarks on the products. As he says, rolls exemplify pressure action, and stamps impact, while pressure-impact is utilized in Huntington and Griffin mills. A number of the former machines are in use here, crushing the soft oxidized ores. They deal with up to 40 tons each daily very effectively. As to the Griffin, the South Kalgurli, Perseverance, and Great Boulder mills had 4, 16, and 13 of these, respectively, and from the two former mills they have been discarded in favor of ball-mills, while additions to the latter mill are made by installing ball-mills. The Griffin works by pressure-impact, as ore in the mill is found to have a sharp fracture. Dynamite, which finds its way into the mill, explodes violently, generally breaking the pan and suggesting impact. If the mill runs empty, the muller bangs hard on the die-ring, and often the spindle breaks. The Griffin product is fine, and up to 70% will pass 150 mesh, being crushed through a 15-mesh screen. These mills are rather costly to run, and are not favored generally.

In describing pressure-torsion machines, Mr. Sperry does not mention the grinding-pan, which no doubt comes under this head. The shoes on the muller-plate of the pan press heavily on the dies, and as they are revolved, a dragging or twisting motion results, the ore particles being crushed by pressure and dragging or twisting set up. The pan is a good grinding machine, and with feed of which only 45% will pass 150 mesh, 85 will pass the same screen after grinding. About 75 five-foot and 19 eight-foot pans are in use on this field, most of them grinding roasted ore, the balance working in series with tube-mills on raw ore.

The tube-mill is probably the best example of impact-grinding. I understand the action of this mill to be one in which the pebbles are carried almost to the top of the mill, and fall in a shower to the bottom, striking other pebbles at the bottom, particles of ore being crushed by the impact. A tremendous amount has been written on the tube-mill, but I have never seen details of a microscopical examination of the slime particles, whether they show a sharp fracture or otherwise. Of course, a great number of pebbles are simply carried up a certain distance, and then slide back again, or roll over one another to the bottom. Pebbles doing this, would grind the ore more or less. In 1904, the Krupps in Germany made a number of experiments on the action of the tube-mill, these being described by H. Fischer in several technical journals soon afterward. Photographs were taken of the pebbles in action in a mill made for the purpose, and these showed the impact action quite clearly. It would seem that the plain type of liners for the tube are not as good as the corrugated or rough type usually used now, for the reason that the latter toss the pebbles about more, giving more chance for the impact of one pebble against another, while the smooth liner does not tend to carry them up far, irrespective of centrifugal force.

Where I do not agree with Mr. Sperry is in regard to the ball-mill. He said: "The ball-mill is a modification of the tube-mill with the substitution of steel balls for pebbles, and steel lining in place of the silex brick. It is designed for dry grinding, and is used extensively in cement manufacture." It is doubtful whether the Krupp ball-mill, which seems to be the most efficient of all the ball-mills



Balls, Stone, and Pieces of Steel From Ball-Mill.

Note Rounded Shapes and Especially the Perfect Roundness Maintained by the Balls While Wearing Down.

is used anywhere with greater efficiency than it is in Kalgoorlie. There are here at work 27 No. 5 size, which crush up to 45 tons each per day, and 17 No. 8 size, which crush up to 90 tons each. About 45% of the product from a 25-mesh screen on the mills will pass 150-mesh. Now, I fail to see how the ball-mill is a modification of the tube in any way. According to size, the Krupp mill is charged with 1 or 2 tons of steel balls, and revolves at 21 to 25—in one case 24—revolutions per minute. The ore, crushed by the balls, passes through the perforated grinding-plates, and is screened by the coarse or inside punched screens, the oversize being automatically returned to the interior of the mill, while what passes the inside screen is screened by the outside or fine-wire screens, the oversize also being returned to the mill. When the ore is ground fine enough, it is at once passed out of the mill. The working of the mill is ingenious, to say the least. The grinding action of the balls is not due to impact. The only impact that might take place is when the balls drop from one grinding plate to another, a distance of 4 inches in a new mill. The action of the balls is one of pure rolling, grinding, and abrasion, the balls being lifted up level with the mill shaft or axle, and then simply rolling back, tumbling over one another, rubbing and grinding away the ore between them. This is not mere supposition, but fact, as I have actually seen the action. At the Associated mill there are four No. 5 Krupp mills crushing oxidized ore, which contains 5% moisture. Very coarse screens are used on this, as the fine

screens, 25-mesh, would be clogged. In crushing this ore no dust is made, so by the aid of a portable electric light, placed well down in the feed hopper, the balls can be seen working. Repeated observations show that the balls and ore are carried up about level with the mill shaft, and having reached this point, start to roll back, and the whole 1200 lb. of balls (light balls being used on this soft ore) roll and tumble about, grinding the ore by abrasion. It is a most interesting sight, fully proving that there is no impact grinding. To further prove this, it is only necessary to take note of the ore in the mill when it is stopped for repairs. Down to the finest particle, it is round and smooth, just as if water-worn from a river, where stones are quite round from rolling. Pieces of drill steel, from the mine are fed in at times, and these become rounded in the mill, although they hinder the good work of the balls to some extent. The Krupp mill works either wet or dry, but is especially efficient as a dry crusher. To support my theory, I enclose a picture showing the perfectly round form the balls keep in wearing from full size to the smallest, the rounded pieces of ore and steel, the latter originally hexagonal, and two pieces of plate which do not add to the grinding efficiency of the mill. I have a paper on 'Ball-Mill Practice' in preparation, which I hope to publish in your journal, and which will be of interest to millmen generally.

M. W. VON BERNEWITZ.

Kalgoorlie, Western Australia, October 10.

Are Engineers Honest?

The Editor:

Sir—In reviewing a back number of the *Mining and Scientific Press*, I find an article entitled 'Are Engineers Honest?' Most of them are. And there are some who are so honest that they would not accept a share of the promoter's commission unless the promoter mentioned it first. There are others who would not permit a sale to go through unless they did get a division of the commission. I have suffered from both. A certain property in Nevada had been offered to prospective investors in Iowa. They sent an independent engineer to make an examination. The measurable ore in sight consisted of about 30,000 tons of $12 ore. In a surface deposit, which had been thoroughly prospected, was available something like 150,000 tons of $6 ore. The engineer declined the property on the ground that the ore did not come up to the figures in the original report. His only contention was that the surface deposit was not an asset and that "nothing that nature has exposed can be regarded as ore in sight." Ore blocked out it was not; but 'ore in sight' it certainly was. However, later a company was organized to operate this same property and the gentleman in question became a member of the directory, as well as consulting engineer for the company, and every one of the prospective investors in Iowa received a recommendation from him to purchase the stock at a figure that made the property cost the stockholders more than twice the price at which I had offered it—notwithstanding that in the meantime not a dollar's worth of work had been done and the conditions were the same as when the engineer made his first report. Was this man honest?

A property in California was offered to prospective buyers at Pittsburg. The vein was five feet wide, but contained about two feet of ore that was of too low grade to warrant sending it to the mill. This two feet had always been discarded and thrown over the dump. In the estimate of ore reserves given in the original report this fact was particularly mentioned and the tonnage based entirely on the three feet of profitable material. The independent engineer who examined the property took his samples entirely across the vein, notwithstanding that he was furnished with a copy of the original report. Naturally his results fell well below the original estimate. In contrast with the gentleman mentioned above, I believe this engineer was honest. But his discrimination was bad. He should not have included two feet of worthless material in his sampling.

A certain engineer with an established reputation in South Africa, Australia, and South America recently examined a tungsten property in the Southwest. This was an extensive surface deposit and had been favorably reported on by one of the best authorities on rare metals in the United States. The gentleman from South Africa looked at this deposit from a distance; he did not enter any of the workings, and did not even inspect the vein closer than 500 yards away. He returned to his principals and condemned the property on the ground that it did not 'go down.' Now, what would happen to this tungsten if it should go down? It would most certainly develop a sulphide and in that case it would be almost impossible to market it at all, as the elimination of sulphur from tungsten concentrates has not yet been successfully accomplished, and the German buyers who were figuring on purchasing this deposit stated emphatically that what they desired was a large surface deposit and that the concentrate must be free from sulphur. This engineer had previously stated to me that he had paid no attention to the rare metals and was not familiar with them. That being the case, he had no business to accept the commission to examine a tungsten deposit. Was this engineer honest?

Among the twelve most familiar names of mining engineers in the United States is a gentleman who operates quite extensively in the Southwest. This engineer drove eighteen miles from the railroad to look at a copper property, spent less than two hours on the ground, returned to the railroad, 'turned down' the property, and received a fee of $100 per day and expenses for his 'examination.' About three months later he offered to take an option on the property from the owner and stated that he could sell it in New York 'at a big figure.' Was this man honest? How long will investors continue to pay for such service? No profession today requires more integrity, better judgment, or more careful work than that of the mining engineer, and it is time there should be an end to 'examinations' of the character mentioned above. GEORGE F. GOERNER.

El Paso, Texas, November 30.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining and ore dressing.

Costs are usually much higher when actually kept than when "estimated." At one property recently the superintendent "estimated" the mining cost at $1 per ton, and the milling at 50c. Several months careful record showed the first to be really $1.20 and the second $1.10.

Switches may be placed in trolley wires so arranged as to be thrown by the same lever that opens or closes the switch in the track. Such a device has been in use for some time at the Cresson mine in the Cripple Creek district of Colorado and works satisfactorily. It obviates all slipping of the trolley and saves time and labor.

Publications of the U. S. Bureau of Mines may be obtained free upon application to the Director, U. S. Bureau of Mines, Washington, D. C. Two bulletins have so far been issued but the new Bureau also distributes certain of the bulletins of the U. S. Geological Survey based upon work done by the Technological Division of that organization prior to July 1, 1910.

In caisons, the limit of practical working pressure is about three atmospheres, or about 45 pounds per square inch. At this pressure work can be performed at a depth of approximately 100 ft. Not many men can work under such conditions, and there is no doubt that the lives of caisson workers are shortened by the unnatural pressure on the lungs that such occupation and attendant conditions impose.

Civil Service examinations for various positions in the public service are constantly held in many cities and towns. Details can always be learned by applying to the U. S. Civil Service Commission, Washington, D. C. There is a chronic shortage in male stenographers, and any young man capable of doing good work as a stenographer is reasonably sure of appointment if he pass the examination successfully.

Mill saving can only be estimated approximately by means of tailing samples, for the reason that at best no proper allowance is made for the value of dissolved metals. Frequently also much of the metal is so finely divided that it floats past the sampler and is lost. There are many concentrating mills where saving is supposed to be 90%, but is really 65 or less, as has been shown where sale of concentrate was checked against proper sampling of the mill-feed.

Carbonas are irregular tin deposits occurring in granite and found only in West Cornwall. They are described by J. H. Collins as "silicious, and generally highly chorlaceous segregations containing enough tin to be worth working." They are usually slightly connected with lodes. Those formerly worked were all discovered by accident, and possibly many others remain undiscovered. Some of these are [illegible] originated in a cavity of [illegible] became enlarged by sub-Hercynian solution [illegible] precipitation.

Potash salts are mined in Germany to the amount of 6,000,000 tons annually. Exports amount to $3,000,000 in value per year and the potash mines are coming to be regarded as one of the country's greatest natural resources. The Kali Syndicate controls 60 mines and it is reported that 40 more are to be opened, thereby increasing the output 100%. Germany has at present a practical monopoly of known potash deposits. Hanover is the recognized centre of the district, though most of the mines are in the vicinity of the Harz mountains.

Decantation methods of cyanidation almost always necessitate crushing in solution, as otherwise the pulp must be dewatered before cyanide solution can be added. A few years ago when amalgamation was more general, decantation was common. Running solution over the plates, however, in time ruins them, and for these and other reasons it is becoming common, particularly where silver is present in the ore, to do away with the amalgamation, to crush fine, and to depend upon filters. New plants are quite generally built on these lines, in the United States particularly, and old ones are being remodeled.

Dredges may be counted toward annual labor and for patent improvements under certain conditions. For example, where it can be satisfactorily shown that an area embraced in a placer location, or a group of locations held in common, contains deposits of such a character and extent as to permit them to be more economically worked by means of a mining dredge than by any other means, that the owner of the claim or group has in good faith purchased, and actually placed in good working order thereon, a dredge, for the exclusive purpose of working such deposit, and that the dredge has not been used as the basis for patent for any other area, it is entitled to be regarded as a mining improvement so far as that particular claim or group is concerned, and to have its cost accredited thereto. Under such circumstances the value of the dredge can be applied, for both patent purposes and annual assessment work. Necessary remodeling and improvements on the dredge if of a permanent nature, should also answer as assessment work if the dredge itself conforms to the foregoing requirements. The operation of the dredge on one of the claims will hardly answer for assessment work for the group. The Land Office has decided that work on the lower end of a placer deposit started so as to work upstream and avoid the necessity of rehandling the tailing, facilitates the extraction of mineral from the entire group of claims only in a remote sense, and that the value of such work done on one claim of a group can not be accredited to an adjoining claim as an improvement for patent purposes. While the courts are usually a little more lenient in their rulings on the character of assessment work required, yet the same general principles apply.

Special Correspondence

BULAWAYO, SOUTHERN RHODESIA

Gold Production of Southern Rhodesia. — Output of Other Metals. — Globe & Phoenix Co.—Monomotapa Mines.

The mineral output of Southern Rhodesia has been steadily diminishing for some months past, and the return just announced in the September operations constitutes a further decline in production. The total value for September was £196,626 as compared with £216,562 for the month of August. Of the total value recovered gold accounts for £178,950 or £12,473 less than in August. The gold output for September 1910 is found to be £34,299 below that of September 1909. This marked decline, although it may cause shareholders in Rhodesian companies some anxiety, causes no alarm in the country itself. The suspension of normal milling operations at the Globe & Phoenix mine, which is by far the largest producer in the country, and the shutting down of numerous small mills in order to push development, account for the decline in production. The large amount of development being carried out in nearly every district of Matabeleland and Mashonaland foreshadows an early expansion of productive operations, and in so far as the Globe & Phoenix mine is concerned it is satisfactory to note that the mill is now running at full capacity again. During September the company crushed 601 tons only, but secured a yield from this of 1909 oz. fine gold. In order to compensate for the low outputs announced during the period of repair work, the directors have given instructions to mill ore of high grade during the remaining months of the year. The values of the minerals, other than gold, produced during August and September are given below:

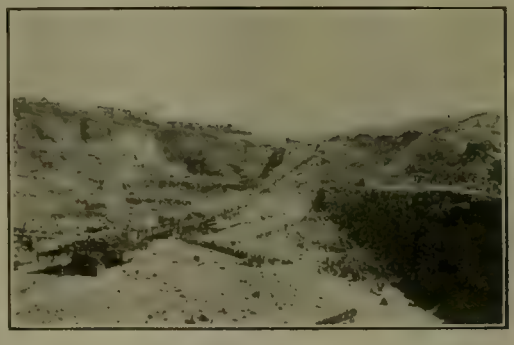
	September.	August.
Silver	£1,758	£ 1,985
Lead	711	701
Chrome iron	3,050	13,875
Copper	9	218
Asbestos	250	300
Coal	7,898	8,060

From this it will be seen that the decline in the production of chrome iron was, apart from the decrease in the gold output, the most unsatisfactory feature of last month's output. The decrease was solely due to shortage of labor and to a hitch in the shipping arrangements at the port of Beira in Portuguese East Africa.——A sensation has been caused in Salisbury by the arrest of Dracopoulos & Coutlis, the late owners of the Colossus mine. They are charged with contravening that section of the mining ordinance which relates to 'salting.' Some few weeks ago N. A. Arnold of Arnold & Co., of Salisbury, purchased the mine from the two defendants for the sum of about £25,000. Shortly after the transfer of the mine there were rumors that the property was not all it was supposed to be, and these reports led to the arrest of Coutlis, near Salisbury. Dracopoulos was arrested at Cape Town a day or two later. The incident is regrettable, as in any case it cannot fail to give an unfavorable impression to European investors, and it is to be hoped that in all cases in future in which a conviction is secured against persons breaking this section of the mining law an exemplary sentence will be passed. ——A report has just been issued by the Globe & Phoenix company in which it is stated that at the end of June last the estimated payable ore reserves amounted to 174,788 tons, of an estimated average value of 32.259 dwt. per ton, the gross value of which amounts to £1,184,097, as compared with £1,124,878 at the end of last year, and £1,045,151 at the end of September 1909. An encouraging feature is that in the lowest workings the ore is of good grade over a substantial stoping width. On account of repairs to the main shaft the ore milled during the six months ended with June last amounted to only 23,535 tons. The output of gold was £183,058, while the profit realized was £137,678. By reason of the small tonnage milled the working costs were abnormally high, being 37s. 3d. per ton milled. It is interesting to note that on the fifteenth level, above the dike, the east reef and combined reefs show a value of 5 oz. 5½ dwt. per ton over a width of 41.6 in., for a length of 1025 ft. of driving. On the sixteenth level, below the dike, the total length driven on these reefs is 725 ft., and the ore averages 131.9 dwt. over 39.3 in., the north drift being still in high-grade ore.——Sir Thomas Cullinan, of Premier Diamond mine fame, has been visiting Mashonaland in connection with his Monomotapa properties in the Kaiser Wilhelm goldfield. For three years development has been proceeding on these mines, and a reduction plant is now being erected there. In about six months it is hoped to commence productive operations on a basis of 10,000 tons per month. It is reported that on one of the properties there is a body of ore about 300 ft. wide, of low grade. Sir Thomas hopes to work this at a profit.

JOHANNESBURG, TRANSVAAL

The New Kleinfontein Mine.—Bantjes Consolidated.—The City Deep. —Tin Mining in the Transvaal.

The New Kleinfontein mine on the East Rand, for some years past, has been one of the most consistent producers and dividend payers at work on the Main Reef series, and much disappointment has been occasioned by the recent decline in profits and by the fall in the grade of the ore reserves. The grade of ore stamped for the month of September was affected by a subsidence in the old stope above the auxiliary east shaft which resulted in a reduced



Premier Diamond Mine.

tonnage for that part of the mine. But the trouble at the New Kleinfontein is evidently of a more permanent nature than one would gather from this statement which has been issued by the board of directors. It is officially admitted that recent developments have been below the average and that in consequence of this the directors "have decided temporarily to reduce the grade," and there will be a reduction in profits to £20,000 per month. Last year the company's profits averaged £25,000 per month, so that the dividends for the time being are likely to be affected detrimentally. At the end of 1909 the average assay-value of the ore reserves was given at 7½ dwt. per ton, but these have since declined to 7 dwt. As against this depreciation it is important to note that the milling equipment is being increased, and it is expected that the company will be crushing 50,000 tons or more per month by June of next year, instead of 40,000 tons as at present. This increase in the scale of working should bring about an appreciable reduction in working costs which are now about 16s. 6d. per ton milled, and it is trusted that the economies resulting from milling on a larger scale will counteract the fall in the grade of ore crushed.——The disappointing returns from the Bantjes Consolidated company during the first few weeks of crushing had a most depressing influence on the Kaffir market. Pessimistic rumors were afloat regarding the mine, and these were strengthened by the unsatisfactory results which were announced by the Vogelstruis Consolidated Deep Co., results which led to the closing down of the mine which adjoins

the Ranges to the west. It is not to be expected that in the first few days of milling a new mill will show its real capacity of its normal production. Only from then is there a certain amount of gold in circulation in the cyanide plant and a certain amount is absorbed in setting the plates. A new amalgamator has been installed and confidence in the property and the management is returning and justified. It is clear that the mine is going to justify the best opinions formed of it before milling operations commenced. A cyanide shortage has also caused by the amalgamator and the ore has been was to commence running the fourth mill by the return [illegible] cyanide from Johannesburg. No doubt the shortage of the district has been to some extent determined by the reaction which the mine and financial crisis of the Rand Gold Mining Co. has caused. The Rand Gold Mining Co. has been practically out of all production to their actual significance and value. In the last month the reduction works of the City Deep will have a capacity of 60,000 to 65,000 tons per month, and it stands to reason that such equipment cannot be got into normal order in a few weeks. There is something in the nature of a tin boom in the Transvaal at the present moment. The investment of a large sum of money in the Rooiberg Minerals Development Co. by such an influential and wealthy corporation as the Anglo-French Exploration Co., coupled with the good results obtained in the development of the mine, and also the profits being earned at Zaaiplaats and other mines in the Waterberg district of the Transvaal, have directed the attention of investors to the possibilities of tin mining in the Transvaal. In the eastern part of the Rooiberg mine some rich ore has been opened, and this quite apart from the network of lodes which constitutes the main section of the Rooiberg mine.

JARBIDGE, NEVADA

Good Progress in Development.—Many Leases.—Pavlak Mill.—A New Wagon-Road From the South.

There is greater activity in the camp now than ever before and the future of the district looks bright. A mill is being built, two new roads are being constructed, and prospectors are finding ore in many places. The Pavlak Co. was the first to begin development and it is the first to purchase and erect a mill. Contracts have been made with the Chalmers & Williams Co. for a cyanide plant which is to be placed in operation as soon as possible. Most of the material for this mill is now on the way to the camp, and 10 or 12 freight teams are arriving every day with lumber and machinery. W. T. Morgan is superintending the grading of the millsite. The timbers for the mill building will be hewed from native trees, found on the ridge between the Jarbidge river and Bear creek; the logs are being brought down to the river bottom. The mill is to be built on the bank of the Jarbidge river, at the mouth of the adit, and the solution tanks will be placed on a bench 80 ft. above the mill-floor. Sidney Coburn, superintendent for the Pavlak company, has done much for the prospector and the camp in general; he has employed local help and patronized the local stores where possible. He is now giving work to men who have been prospecting all summer. The mill is to treat ore from other mines, though the company is opening up so much ore on its own ground that it is not probable that it can handle a large tonnage of custom ore.——The 4-M lease is driving north and south on the vein at the 50-ft. level, and is accumulating a lot of milling ore.——The Riddle-Corrigan lease has the vein opened by two adit levels, and has considerable ore in sight which runs from $12 to $16 per ton.——The Curley lease has driven 80 ft. on the vein and has ore that pans well.——The 'Ham And' lease, on Pavlak ground, has an 80-ft. adit on the Taft vein, which parallels the Pavlak vein. The ore thus opened pans $14 to $65 per ton. This lease is in the hands of Albert McCloy, Cash Andrews, and C. E. Murry. They have started a cross-cut that will tap the orebody 65 ft. below the first adit, and enable them to derive their ore on the second level. The Arizona Rainbow company, for which Theodore Parry is superintendent, has driven an adit 90 ft. on the Arizona side to which is a showing of good ore. This adit will [illegible] the main Pavlak vein in the next 40 ft. The company will be able to supply ore to the new mill. The Good Luck mine, also in charge of Mr. Parry, has driven 50 ft. and cross-cut 100 ft. and has some high grade ore. The Tip Top bonding is nearly made; the bonding options and Mr. Parry expect soon to cross-cut the vein. The Good Luck has a shaft on the North Star vein 150 ft. deep, with the lower adit a foot of rich ore and 2 inches of the vein. Lance Duncan has bonded the Gold Coin, Pioneer and Butte Brown claims for $50,000 to Denver men and associates who are to arrange to work the property. Theodore Parry has bought the interest of Pete Garner in the Last Chance No. 1 and No. 2 claims south of the Pioneer mine. He expects soon to begin the development of the property. McCormack and partners have bonded the Sugar group of four claims in the Fourth Crater for $50,000, to Lee Griffith, who represents Butte capital. Edge Fletcher and others of Boise have started a cross-cut on their Miss Mac group, northeast of the Bourne. This property is east of the quartzite dike and some of the surface dirt pans well in free gold. The Free Treasure Gold Co. has opened three veins on the east slope of Jumbo peak and is finding good ore, including high-grade specimens. Work in the Jack Creek Crater, three miles southeast of Jarbidge, on the property of the Coeur d'Alene Jarbidge Gold Mining Co., is progressing well and with good results. The property is favorably situated for cheap and quick development. Present work is upon two ore shoots, containing some free gold. The company has made preparation for the work and six or eight men are to be employed this winter. The Elko county commissioners have undertaken to build a new wagon road into camp from the south, connecting with the Deeth road at Charleston, which will give an outlet to the Western Pacific railway at Deeth, affording cheaper freight rates and reducing the price of merchandise in this camp.——A company has been organized with a capital of $10,000 to build this road, the county guaranteeing to take up the stock in one year at an advance of 8%. A force of men, 20 teams with scrapers and two road machines are at work on the new road, trying to have it ready for winter travel.——The Elko County road to Jarbidge is causing the Twin Falls merchants to have a new road surveyed out of the camp which will give an easy grade and avoid the bad points on the old road, besides making the distance several miles shorter. Effort is being made to finish this road as soon as possible in order to have it ready for the hauling of heavy machinery for the Pavlak mill.——The next great need of the camp is telephone connection with Elko and Twin Falls. The Elko Telephone Co. has the money ready to build such a line and has asked for bids to extend its line from Gold Creek to Jarbidge.

GOLDFIELD, NEVADA

Affairs of the Goldfield Consolidated.—Litigation.—The Florence Orebodies.—General District News.

The regular quarterly meeting of directors of the Goldfield Consolidated Mines Co., announced for December 1, at the Waldorf-Astoria hotel, New York, will have been held before this is in print. John H. Mackenzie, director, consulting engineer, and formerly general manager for the company, came to Goldfield last week to inspect the mines and mill, and left for the East in company with A. H. Howe, secretary and treasurer, and J. R. Finlay, general manager. At Reno they were joined by the president, George Wingfield, and it is said that W. C. Ralston, of San Francisco, another director, proceeded to New York with them. In the absence of Mr. Finlay the company's operations are in charge of J. F. Thorne, assistant general manager. Mr. Finlay's report to the board of directors concerning the results of recent work on the 1000-ft. level of the Clermont mine will be looked for with much interest.

The new ore-shoot being followed at this depth thus far has averaged about $65 per ton, and the deposit is apparently of great magnitude. It is believed to be identical with the famous '403' stopes of the adjoining Mohawk. This rich ore is readily separated from the rest and is used with low-grade ore to maintain the desired average in mill-heads; or is sometimes shipped to smelters for separate treatment. On the 750-ft. level of the Clermont there remains a good deal of ore of this character as well as at other points, particularly in the Mohawk and Combination. The largest tonnage of ore now comes from the Clermont, which has supplanted the Mohawk as the leading producer of the five mines. The product of the Clermont also leads the other mines in grade of ore.——Suit has been filed against the Consolidated company by the Frances-Mohawk Mining Co. to recover the sum of $254,800, which the latter alleges is 77½% of the amount of rich ore stolen from its lease on the Mohawk and from the Hays-Monnette lease, during the life of those bonanza leases, and which it is claimed was recovered by the Consolidated company. A part of the amount represents a claim assigned by the Hays-Monnette people to the Frances-Mohawk company. The complaint alleges that ore valued at $500,000 was stolen by miners and others from the Frances-Mohawk lease, and that $300,000 worth of high-grade ore was taken from the Hays-Monnette lease; but that the Consolidated recovered only $334,000 worth of the stolen ore. The Consolidated and Frances-Mohawk have been involved in litigation for over two years, several suits being still pending in the courts of this State. ——The Florence Goldfield company is to drive laterals from the 600-ft. station to explore several orebodies that have been highly productive on and above the 500-ft. level, and the management is convinced that this work will result in opening ore equal to that mined so profitably by lessees. During the past year the work on the Florence has been largely devoted to cleaning up the old lease workings, and connecting the various workings in order that mining may be carried on more effectively. All the main drifts, stopes, and levels are now connected with the main shaft, chiefly on the 350 and 500-ft. levels, and it is said there is a large tonnage of ore in sight. The mill has been making a profit from the lowest-grade ore treated. Some of the best ore is being taken from the stopes opened by the north drift on the 350-ft. level. Good ore is exposed on the 500-ft. level, between the main shaft and the workings of the old Engineers' lease. A winze sunk 60 ft. below the 500-ft. level on the Rogers-Syndicate lease, has also resulted in opening good ore. The three leases yielded a large tonnage of rich ore and paid good profits to the operators, who, under the terms of the leases, were prohibited from removing ore sampling under $35 per ton. In the earlier operations ore worth less than $70 per ton was not marketable by lessees.——Ore of good grade is being sent to the sampler from the Red Top Extension, being worked under lease by some of the stockholders of the holding company. An ore-shoot was exposed by raising 68 ft. above the 500-ft. level, 100 ft. from the shaft. The ore is said to be 6 ft. wide and assays an average of $40 per ton.——Small shipments have been made lately from the Goldfield Annex lease on the Polverde claim of the Jumbo Extension, adjoining the Clermont. Some ore was taken from the 800-ft. level last year, but the shoot was lost and the shaft continued to a depth of 1100 ft. Failing to find ore at the deeper level, work was again commenced on the 800-ft. level with the result that the lost ore-shoot was recovered in a cross vein, thought to be an offshoot of the Clermont.——Good ore is in sight on the 250-ft. level of the Knickerbocker-Wheeler lease on the Spearhead, and the vein has been opened on the 350-ft. level. This vein is unlike anything opened in the district, the mineral content of the ore being gold, silver, and copper, running heavy in iron and copper sulphide.——Driving continues on the 1170-ft. level of the Grizzly Bear lease on Consolidated ground, a short distance south of the Clermont, but only low-grade ore has been exposed.——In the southern part of the district the Yellow Tiger has work in progress on the 700-ft. level.——On the 450-ft. level from the Victor shaft of the C. O. D. Consolidated there are indications that the ore-shoot displaced by a fault on the 300-ft. level has been found, and lessees are developing at 600-ft. depth on the Gold Bar claim.

ALASKA

High-Grade Ore Near Fairbanks.—Successful Leasing.— Winter Work on Placers.

With the last clean-up of ore taken from the Crawford lease on the Rhoads-Hall vein, it was found by figures given by the banks that the 3-stamp test mill at Fairbanks has pounded out during its brief existence almost $40,000. This mill has been in operation about a year and a half, and, except for the ore mentioned above, has worked exclusively on small lots for test purposes only. The ore taken from the Rhoads-Hall property will average about $150 per ton in free gold. A clean-up of a 9-ton lot showed $170 per ton, while one lot of 17 tons yielded $178 per ton. Concentrate from the ore assayed $1000 per ton; a doré button of ¼ oz. being smelted from 5 lb. of concentrate. ——Fairbanks creek has been the scene of much activity in prospecting lately. August Hess reports finding a rich vein a few days ago opposite placer claim No. 13 Above Discovery. Little work has been done, but the rock shows considerable free gold. A quarter interest in the group of eight claims owned by Cook Bros. & Lundblad was recently taken over by L. M. Drury and Paul Hopkins. Mr. Hopkins is the assayer for the Washington-Alaska bank, and Mr. Drury is proprietor of the Tanana assay office. This group of claims is on the left limit of Fairbanks creek, opposite creek claims 11 and 12 Above Discovery. Four samples from one of the claims of this group assayed $124, $93, $53, and $206, respectively. The last sample was from the bottom of the shaft. Development work will be carried on all winter and a small test shipment will be sent in soon. The veins have a good width and excellent walls.——Two leases have been let on Alois Frederick's ground near the head of Vault creek. Ernest Peterson has a block of ground above the railroad track, and Glazier, Crockett & Polson have a lease directly below. Buildings are being erected and development will be carried on all winter. Machine-drills have been ordered. It was found lately that the railroad track, where it cuts across the vein, is ballasted with rock worth $100 or more per ton.—— E. W. Herschberger, who originally had a lease on the upper end of the Frederick's vein, has just run a 6-ton lot of ore at the local mill. The clean-up showed the ore to run $60 per ton in free gold.——Across Vault creek and seemingly on the extension of the Frederick's vein, Hoel Bros. and Johnson & Witman are preparing for work this winter. Buildings are being erected and supplies hauled. Sam Moe and partners recently sold their property on Eva creek for $8000. Eva creek is a tributary of Ester and is thought by many to have contributed most of the gold to the famous Ester creek. Among the small lots of ore awaiting treatment at the local mill are several tons from the Anderson property on Birch hill, a few miles from town. This is from a 5-ft. vein. A test run on ore from the 5-ft. vein on Cleary hill, belonging to W. McDonough and partners, showed $30 per ton in free gold. The concentrate has not been assayed as yet.

The adit being driven on the Spaulding vein from the lower end-line shows it to be widening into a good ore-shoot. On the upper end, Huddleston Bros. have a lease and have buildings completed. They start work on the 60-ft. shaft sunk by Spaulding & Clough that shows 3 ft. of good ore.——Several tons of rock from the Pioneer quartz claim was run in the local mill last month and returned $70 per ton free gold. Mr. Calvin also put through a small lot from the Jupiter-Mars which is said to have shown still better results. Efforts have been made lately to compromise the differences between the Butler-Petree people and the owners of the Rex, the adjoining property. These efforts have failed, however, and a suit to quiet title will undoubtedly be brought. Both properties are prom-

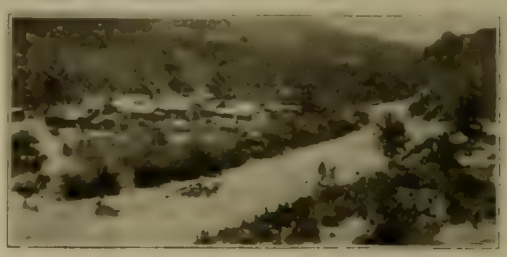
lating considerable work having been done on the Ester Pet[ere] where a 100-ft. incline shaft shows a wide vein the whole depth.

The custom mill at Chloride City is nearing completion. Many offerings of ore have already been made, and when the big tunnel on the Stanley Clough property and the Dudrow's get started the mill should easily be kept busy. Mr. Cruttenham is in charge. —— Some pay has been found on the left limit of Quail stream and two other creeks have developed better pay. On Dome creek pay has been found high on the right limit opposite No. 8 Below. A continuation of the Ester pay streak has also been recently found by a drill. The pay seems to run through the right limit of Ester where the benches have always been wet. The new ground is also wet but pannings from the drill hole show a value of $17 per square foot of bedrock, enough to insure a handsome profit if the ground is uniform. —— The river is now closed for navigation, the bulletin board reading: "The last boat will be a four horse stage, leaving Thursdays and Sundays."

NEW YORK

Prices on a Low Level.— Railroad Securities. — No More Speculating Directors.—Copper Interests Co-Operate.— Incentive for Copper Merger.—No Real Curtailment.—Copper Dividends. — Utah Consolidated & I. S. & R.

The event of the week in financial circles was the collapse of the attempted bull campaign reputed to have been backed by the Morgan interests. Prices were carried well toward the low levels of the year. The railways are going through a period of transition. The new element in the transportation problem is the public, represented in commissions, and commerce courts. The effect in the financial market will be to remove the railroad securities from the field of speculation and put them in the investment class. Speculating directors are to be eliminated and in the future boards will be required to really direct the operation of the roads. —— The Government's suit against the Sugar Trust has revived the feeling that the Supreme Court is certain to decide against the corporations in the Standard Oil and Tobacco Trust cases. Until some way is found out of the present entanglement of affairs, broad market operations are not to be expected. This is clearly demonstrated in the copper situation. The co-operation between the various producers is frank and apparently complete. Most of the leaders got together as guests of John D. Ryan at a dinner at Sherry's last week. The copper merger is apparently to await the action of the Supreme Court. If, in the meantime, producers can co-operate and curtail, sell accumulated metal, and strengthen cash reserves, it is so much gained. Just now it is not co-operation or economy of operation that is the incentive for a copper merger. It is to provide the market with a new and popular leader and to create and distribute a billion of new capitalization that is desired. —— The forthcoming statement of the Copper Producers Association for the month of November will be awaited with interest. While there is much talk of curtailment, figures from individual properties fail to show great restriction of production. Utah Copper produced in October, 7,582,219 lb. of copper, which is about one-half million pounds more than in September and nearly as much greater than the August output. The production of the Nevada Consolidated in October was 5,250,000 lb., being an increase of about 100,000 over the September output. The Butte output for November is estimated at 23,636,550 lb., as against 22,913,781 for October and 22,990,050 for September. It is hard to see where the curtailment is to become apparent. The regular chain of Guggenheim dividends are being declared. In some cases these dividends are declared and paid four times before ultimately reaching the pocket of the individual shareholders. Nevada Consolidated pays 37½c. per share quarterly; Utah Copper, 75c; Guggenheim Exploration, 2½; Yukon Gold, 10c. per share. —— The special meeting of the A. S. & R. Co. has been called for January 5, 1911, to authorize the issue of $[illegible] of convertible bonds of the Ver[illegible] Smelting Co. The conversion privilege gives [illegible] the right to exchange the bonds for the common [illegible] of the A. S. & R. Co. whenever the bonds are [illegible] later. The bond issue is underwritten by Kuhn, Loeb & Co. and has been, in turn, divided among the members of a syndicate of the leading banks in the street. It is on the expected conversion of the bonds and consolidation that the meeting company will ultimately receive the proceeds giving it approximately $15,000,000 additional cash capital. The cash in hand at present is about $12,000,000, and metals on hand accounts in value about $[illegible],000,000. On this basis the cash assets of the company will total about $[illegible],000,000, which just equals the preferred stock liability. The properties of the company and the common stock of the Securities company represent therefore the common stock of the smelting company. The president of the A. S. & R. Co. says in his letter to the stockholders: "This company is now in receipt of ores and bullion from Africa, Australia, South America, Spain, France, Central America, China, and Alaska. As yet it is only feasible to transport Alaskan ores produced on the sea coast, but with the construction of railroads, it is believed that a great mineral production will flow to the smelting and refining plants of this company."—— One of the principal events in the copper-share market was the settlement of the suit brought by the North Butte company against the Tuolumne Copper. The compromise was apparently a complete backdown for the North Butte, the net result being that matters stand just as they did before the suit was begun, save that Tuolumne has waived any claim for ore wrongfully extracted by the North Butte. The buying in the shares reflected some accumulation of the stock by North Butte interests, but the decline in the big market which has been drastic throughout the week has caused the issue to ease off and activity to become less marked. —— The end of the life of the Utah Consolidated, coming unexpectedly, will be somewhat of a blow to the I. S. & R. Co., whose new plant at Tooele was erected largely to handle the ores of the Utah Consolidated. The aerial tramway which is to carry the ores from the Utah Consolidated to the smelter at Tooele has never been taken over from the builders, though it is said that it is now working satisfactorily. In reference to this situation, the I. S. & R. Co. has issued a statement saying: "Our contract with the Utah Consolidated is at a low rate of toll. When it was seen that Utah Consolidated was not going to maintain the output expected, we made an active canvass and secured other contracts, so that practically from the date of the beginning of operations, the outside tonnage has been as large or larger than the output of the Utah Consolidated and at much better rates."—— The Ray Central Copper Co. is in the market with $1,900,000 of the bond issue remaining in the treasury seeking an underwriting; with the bonds there goes an option on 250,000 shares of stock at $1 per share and the active management of the company. The present market in the stock is around 2⅜, so that an option at $1 in strong hands would mean a considerable profit for market operations. —— F. L. Underwood has resigned as president of the California-Nevada Copper Co., and has been succeeded by M. N. O'Boyle, of Pittston,



Mineral Creek, Ray, Arizona.

who is one of the large independent anthracite coal operators in Pennsylvania.——The California-Nevada Copper Co. is building a large mill on the Ebner gold property near Juneau, Alaska.——In mining circles an important feature is the growing interest in Porcupine. The camp is said to be very active. The frost has hardened the trails and traffic in and out is heavy. There are many sales reported at big prices, but these deals are said to be made on long-time bonds; however, many cash sales are being made, claims bringing from $1000 to $5000 each. The area of mineralized ground is being widened materially, many claims being staked out in the Reserve to the south.

WASHINGTON, D. C.

Report of Secretary of Interior. — Recommends Appeal of Land Cases to Court.—Recording of Mineral Location Notices. — Leasing Oil Lands.

The report by R. A. Ballinger, Secretary of the Interior, contains many recommendations of interest to mining men. The Secretary urges the prompt passage of House bill 27071 which authorizes appeal from the final decision of the Department in land cases to the Court of Appeals of the District of Columbia. He also recommends that the famous Alaskan coal land cases be transferred directly to the court without the necessity of a ruling by the Commissioner of the General Land Office, and strongly condemns the present chaotic conditions regarding coal land in Alaska. He recommends legislation requiring that notices of mining locations be recorded in the office of the register and receiver of the land districts; requiring final payment and entry for mineral claims to be made within seven years from date of location, exclusive of any time covered by pending adverse or contest proceedings; and modifications of the placer mineral laws so as to provide that no placer location hereafter made, whether by one or more persons, or an association of persons, shall exceed 40 acres in area. In a general review of the situation regarding mineral lands, he says:

"For nearly forty years the statutes have declared that all valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, are to be free and open to exploration and purchase and the lands in which they are found to occupation and purchase by citizens of the United States and those who have declared their intention to become such. Rich deposits of precious metals in the Pacific States and Territories have been discovered and located under these general mining laws and have been operated for many years. Granting defects in the laws, they have accomplished their purpose in causing the mineral resources to be developed and have thus contributed enormously to the wealth of the nation. It is hardly reasonable to believe that any material change will be made in these laws or of the method of disposal of the lode and placer claims of the mineral regions. Here, as in the settlement laws, the Government's liability has had its reward in the material prosperity of the people, and while abuses have existed, they can not be charged so much to the law as to evasions of the law. By the Constitution, Congress is made the steward of the public domain and for its stewardship it is responsible to the people. The executive can move only as directed or authorized by Congress in selling or otherwise disposing of this national estate; therefore all questions relating to a change from the existing status or of policy over this estate resides alone in the legislative branch of the Government, and all popular movements looking to the reformation of our land system must of course be addressed to the Congress. Consequently the movement to conserve the national resources in this national estate of lands—that is, to secure the wisest and most lasting benefit to the nation in their use—is a matter with which Congress must deal. New or amendatory legislation respecting our public lands should be direct, simple, effective, and relate principally to the proper form of disposition of the withdrawn lands—water-power sites, oil lands, coal lands, and rights of way over public lands. The unappropriated public lands of the public-land States and Territories amount to about 712,000,000 acres, and, as compared with the private lands in these various States, are a small percentage of the territory thereof, and the Federal Government should not undertake or assume the entire burden of the conservation of the natural resources of the States in which they are situated, for it has been demonstrated that the States are capable of taking care of these questions in a large measure, as is shown by the legislation effectuating these purposes in States like Massachusetts and Washington, at the extremities of our country."

The Secretary directs attention to the recommendations contained in his report for 1909 for coal-land legislation and quotes from an official statement made in 1907, wherein some of the difficulties which would be encountered in the operation of a leasing system are pointed out, and again calls attention to the importance of enacting legislation which would give the Department an effective method of disposition of coal lands, especially in Alaska. He points out that in Alaska it is possible that a leasing system could be adapted to the country with efficiency and with less complication than in the States. In the States the administrative policy is to secure by appraisement and sale of the coal deposits which would accrue to the Government if the deposits were mined on a royalty basis, but this is not possible under existing law in Alaska, where the price is fixed at a flat acreage rate. In regard to oil lands, he says:

"I am in favor of a general leasing system of oil and gas-bearing lands, such a system as will promote legitimate development of this industry, prevent monopoly, and conserve one of the great natural resources of the country. The oil land of the five civilized tribes in Oklahoma is developed on the leasing system, the term of the lease extending as long as oil is found in commercial quantities. The lessee usually pays to the Government for the use of the Indian one-eighth in value of the oil produced as royalty. This system has worked out very satisfactorily and is in use in many of the oil regions of the country where land is held in private ownership and not by the Government. I would apply the leasing system only to areas withdrawn for classification or classified by the Geological Survey. The unknown and unexplored oil lands I would leave open to exploration and location. This would give a reward to the diligent prospector. Even then the surrounding lands could be withdrawn from further location after the prospector had secured his first claims. I recommend that the Government adopt a liberal policy in opening the oil lands in California. The Government ought to support any movement which would reduce the enormous cost of fuel in California. The State ought to be asked to co-operate with the Government to prevent the monopoly of the oil business and effectually to secure a reasonable price to the consumer. In my judgment this can be accomplished if the State of California should declare the consumption of oil a public use. The State should pass a law to this effect, and place the regulation of the price of crude oil in the hands of a discreet commission."

BUTTE, MONTANA

Davis-Daly Development. — Wild Bill Claim Sold. — East Butte Production.—Butte Reduction Co.—Tuolumne to Resume.—Rich Ore in Goldsmith.

There is an impression abroad that work has been discontinued in the Colorado shaft of the Davis-Daly company, but such is not the case. There is a force of men working every day on development, and, according to reports given out, some fair shipping ore has been opened; but following the policy announced by Mr. Heinze, no effort will be made to ship ore until the copper conditions show some signs of permanent improvement.——The Amalgamated Copper Co. has purchased the remaining half interest in the Wild Bill claim, having previously acquired the other half. This is a valuable property which is surrounded by such mines as the Speculator, Edith May, Ticon, Gray Rock, Corra, Rock Island, Chief Joseph, Ridge, and Miners' Union. Those who sold the half interest are John,

Edwin Melville K. Thomas C. and Frances Nason. Alice Nason Murray and Mr. and Mrs. Arthur P. Hill.

The East Butte company is said to be taking copper loan in New York at 10½c. per pound, which includes a premium. The commence of shipping of the matte about the middle of December at present and which conditions warrant of the output will be decided. Driving on the new ore-shoot discovered on the 800-ft. level shows every evidence of permanency. Two-thirds of the ore being hoisted now is first-class, carrying 5% copper. The second-class ore averages close to 2 per cent.

The concentrator of the Butte Reduction Works is to have some new equipment for the treatment of zinc ore. The only ore being concentrated regularly is that from Classic Elm Orlu mine, and as this is not enough to supply the plant, it is hoped to secure for treatment some of the ore from the Butte & Superior mine. Eastern capital has been secured for the Caroline Gold Mining Co. and a double-compartment shaft is to be sunk on its property in Grizzly Park, about five miles south of Helena.

The Tuolumne being now free from all litigation, is to be put in condition to operate on a large scale. A steel head frame, a first-motion hoist, and steel ore bins constitute the principal part of the new equipment decided upon at a recent meeting of the directors. As the Tuolumne is without railway connection, and as the company is under an outlay of 50c. per ton for hauling ore to the railway, it was decided to construct a spur from the main line to the mine. The shaft now has a depth of 1400 ft. and it was decided to sink to 2000 ft. For this work a hoist is to be installed at the 1200-ft. station, which has been enlarged. The head frame and hoist are expected to be in place within five months, and in the meantime the company will continue shipping about 6000 tons per month. When the Anaconda company purchased the Butte Reduction Works from W. A. Clark, the existing contract for handling the Tuolumne ore was transferred to the Washoe smelter by the Clark interests. This contract expires next February, and the Tuolumne company will endeavor to make the best terms it can with either the East Butte company or the Washoe company.

The Pilot Butte Mining Co. has paid all the indebtedness against the property, which gives it a clear title thereto. Arrangements have been partly made for resuming work. Among those interested as directors are T. F. Murray of St. Paul, W. P. Jahn of Milwaukee, J. A. Percival of Minneapolis, Edward Hickey and J. W. Pratt of Butte. The Pilot Butte has been opened by a 530-ft. shaft, and is considered in good territory.——A discovery of silver and gold ore in the Goldsmith mine at a depth of 100 ft. has caused some interest in mining circles. The property is being operated by miners whose lease expires in a short time. One car of ore netted $17,000, and since the find was made a few weeks ago the lessees have received over $200,000 from the sale of ore. The ore runs as high as 600 oz. in silver and $200 in gold per ton, and the lessees are mining and shipping as much ore as possible before the expiration of the lease. The Goldsmith is owned by C. W. Ellingwood, who worked the property for a number of years, and after realizing over half a million dollars, leased it. Now he proposes to work the property again himself just as soon as the lease expires.

PANAMA

The Journey Homeward of the Mining Engineers.—Compressed-Air Plant at Butte.—Proposed Mining Legislation.

The feature of Thursday, November 10, when a 7-hour stop was made at Kingston, Jamaica, was a luncheon given at the Myrtle Bank hotel by D. W. Brunton, to the 125 members of the party. It was an impromptu but a most enjoyable affair. At 5:30 p. m. the last of the cruise, the sail to New York, was begun. At the session of the Institute held Friday afternoon Charles W. Goodale, of Butte, Montana, presented a description of the new compressed-air hoisting plant at Butte. Electric power brought from the Missouri river plant, 130 miles distant, is to be used to compress the air to 87 pounds. The power is to supply air for hoisting to 12 inches with a radius of three-quarters of a mile. Provision is made for [illegible] that will keep the hoists at work for 20 minutes after the power is shut off by accident or otherwise. The plant is being constructed by the Nordberg Engineering Co. for the Anaconda Copper Mining Co. The paper brought out a considerable amount of interesting discussion as this is a decided innovation in hoisting installation. William L. Saunders in reply to a question by Mr. Jennings explained the difference between this plant and that in Paris which had failed. The difference lay in the fact that the Paris plant was installed for furnishing compressed air for all sorts of power purposes to a large number of small plants distributed over a wide territory and that it could not compete with electricity which came to be used extensively about that time. The Butte plant, on the other hand, is to distribute large quantities of air to a few plants in a limited area, and the conditions are entirely different. William Kent gave a graphic illustration of the Butte scheme in a blackboard sketch. Other speakers were D. B. Rushmore, S. W. Warriner, Hugo Weinberger, William Kelly, E. L. Watson, W. J. Richards, and D. W. Brunton. Mr. Brunton called attention to the fact that Aspen, Colorado, was the cradle of electrical hoists in the United States and that he had helped to rock the cradle. The session closed with the presentation by D. M. Riordan of a prepared statement embodying the sentiments that had been expressed at the session devoted to the discussion of the Canal.——On Saturday afternoon, after a brief paper by W. S. Ayres on losses in the preparation of coal, the report of the committee appointed by the American Mining Congress on revision of mining laws was taken up for discussion. First, Mr. Brunton read the report of the delegates of the Institute to the Congress, and then the report of the mining law committee, which has been distributed in pamphlet form, was briefly explained by Samuel A. Taylor of Pittsburg. The discussion that followed was exceedingly lively. Charles Kirchhoff called attention to one of the provisions that mine inspectors should have no connection with, or interest in, a mining company. He suggested an amendment to the effect that they should also have no affiliation with a labor organization. Eugene McAuliffe, of Chicago, aroused considerable amusement but at the same time showed the serious condition of affairs in the Mississippi Valley coal States, by depicting the conditions obtaining there as a result of legislation and the domination of the labor unions. He said it had got to such a state that the meetings of the operators had become 'talkfests' that would make excellent opera-bouffes, for during this last summer, after a strike of 5 months and 19 days, they went out and paid the labor leaders to sign the contracts. Mr. Brunton told about the mining laws in Australia and New Zealand as he had had opportunity to observe their operation, and Gardner F. Williams from his experience in South Africa told how much more efficient was the enforcement of and the respect for the law in the British colonies than in the United States. Inspectors are uninfluenced by politics and do their duty. Hennen Jennings found entire sympathy in his protest against the provision of secrecy. He said that in the Rand the publication of all facts in regard to mining operations had done no harm, but had been distinctly beneficial. S. D. Warriner paid a high tribute to the work of the Anthracite Strike Commission and that of the board of conciliation created by its award. He said that since the awards of the commission had been in effect there had been unprecedented peace and prosperity in the anthracite region. He is, however, looking with some feeling of apprehension to the termination in 1912 of the present contract, fearing that in a presidential year the miners may make an effort to disturb the present peaceful conditions. R. B. Watson told of the effects of too much law in Canada. The general feeling expressed was that while there was a great deal of good in the proposed reforms, the draft was fundamentally weak in spots, and would not bring the desired results. The failure to provide for proper disciplinary control is the weakest feature of the proposed law. It is

well known that more than half of the accidents are due to inability to enforce discipline, and yet the committee sidesteps the proposition with the ease and grace of a politician. On Sunday morning divine services were held in the ladies' saloon, Dr. Raymond preaching. In the afternoon Robert P. Porter, of the editorial staff of the London *Times*, and formerly superintendent of the Eleventh U. S. Census, gave an exceedingly interesting talk on South America, which continent he had been recently touring in the interests of the 'Thunderer'. Mr. Porter happened to meet the mining engineers in Panama, and as he was well and personally known to many of the party, he was invited to return to New York on the *Prinz August Wilhelm*. The final session was held on Monday afternoon, the principal feature of which was a paper by Joseph W. Richards, of Lehigh University, on the electrical manufacture of steel. Previous to the presentation of Mr. Richards' paper, Dr. Raymond read a statement which, with any amendments adopted, was proposed to be signed by the members and guests present. In it are expressed the opinions upon which all were in agreement, and as a whole it is a strong endorsement of the present Canal plan and of the manner in which it is being carried out. The time for arrival in New York was 10 o'clock Tuesday morning, November 15, but owing to head winds and the fact that the machinery was not working satisfactorily, it was 7 o'clock in the evening when the steamer reached her dock. As soon as the customs regulations had been complied with, the members of the party hastily departed for their homes or outgoing trains, and a most delightful cruise and one of the most interesting and illuminating meetings of the American Institute of Mining Engineers was ended.

LONDON

Affairs of Huelva Copper & Sulphur. — The Zeehan-Dundas. — Half Year at Mt. Lyell.—Jumpers and Treasury Mines.

A Spanish pyrite company that has been through rough times is the Huelva Copper & Sulphur which was formed in 1903. The control is in France, though the registered office is in London. The management and administration proved unsatisfactory and in 1909 a drastic reorganization was effected. W. J. Barnett proceeded to Spain and made a thorough examination, and Henry F. Collins was appointed manager in September of that year. When the new board enquired into the financial position they found that the capital subscribed had been applied for all sorts of doubtful purposes, none of them connected with the proper development of the mine. Not only so, but a ruinous contract had been made for the sale of pyrite, and that money had been received for it in advance of delivery. The progress of the company has therefore been impeded, and the policy has been to mine just sufficient ore to fill the unfortunate contract and to put all energies into the development of the orebodies. In order to reap adequate profit the consulting engineer and the manager are united in recommending smelting on the spot, but this policy has to be postponed, as there are no available funds. In the meantime efforts are being made to call in some of the money abstracted by the previous directors who have been forced to assume personal responsibility. When the company has straightened its finances and the engineers have developed the mines further, there will be an opportunity for the provision of further working capital. Mr. Collins' report, dated August 2, shows that at the Romero, Angelita, La Corta, and San Alberto mines there are large reserves of copper ore suitable for smelting and cementation, and much ore valuable for its sulphur content. During 1909, about 25,000 tons of 5% ore was shipped, and about 45,000 tons was sent to the cementation grounds.——The Mount Zeehan Tasmania Silver Lead Mines, after yielding profits for 20 years, became exhausted a year ago. Further prospecting and development have as yet yielded no results. Recently Thomas Vincent, the manager, heard of important discoveries at Dundas, 6 miles distant, and on his own responsibility secured an option. This property proved to be of great promise and the company completed the purchase. A subsidiary company, called the Zeehan-Dundas mines, was formed with a capital of £20,000, half of which has been provided by this company and the remainder by the Zeehan-Montana and other allied companies and by individual shareholders. The Zeehan-Dundas property is in the primeval forest and some of the galena veins 2 ft. wide stand out above the peat and soil. The outlook is most promising. The tailing heaps belonging to the Mount Zeehan have not yet been treated and experiments show that a slight modification of the existing plant will afford a ready means for their beneficiation.——The Mount Lyell Mining & Railway has published by cable the results for the half-year ended September 30. The amount of ore treated was 198,617 tons, of which 126,707 tons came from the Mount Lyell, and 71,910 tons from the North Mount Lyell. The average content was 2.41% copper, 1.78 oz. silver, and 0.58 dwt. gold. The produce was 4077 tons of blister copper, containing 4028 tons copper, 325,509 oz. silver, and 5672 oz. gold. The total ore treated was 9000 tons greater than in the previous half-year, and the output of blister copper was 87 tons less, the reason being that some of the ore from the North mine was of rather lower grade than usual. As regards the half-year ended March 31 it was stated that 1359 tons of copper remained unsold. It is now reported that this was subsequently sold at £59 per ton. Of the production during the last half-year, 3241 tons has been sold at an average price of £57 7s. 10d., leaving 787 tons unsold. After paying £5594 for taxes, and charging £10,147 to depreciation and £10,031 to exploration and removal of overburden, the net profit was £90,533. This figure is about £25,000 less than during the previous half-year, due chiefly to the decreased price of copper. The dividend absorbed £75,000, being at the rate of 1s. 3d. per £1 share. The cost of producing blister copper was 16s. 5d. per ton of ore, practically the same figure as before. The reserve on September 30 was 2,720,693 tons at the Mount Lyell, assaying 0.53% copper, 1.96 oz. silver, and 0.56 dwt. gold; and 927,683 tons at the North mine, averaging 6% copper, 1.33 oz. silver, and 0.1 dwt. gold. The addition to the reserves is 85,520 tons, a greater increase than during any previous period. At the North mine the orebody on the 850-ft. level is in places of greater size than was anticipated and developments on the 1050-ft. and 1100-ft. levels are giving good results. In addition to the copper ore, 3751 tons of sulphur ore from the Mount Lyell, and 4706 tons from the Chester mines were sent to the acid works. Prospecting continues at the Norfolk range properties, and though there is some encouragement for further work, nothing of real value has yet been found.——The Jumpers is one of the original outcrop mines in the central Rand, and, as its name implies, is a small portion of what would have been Geldenhuis ground if the surveyors of the latter company had worked accurately. The mine is now nearing exhaustion. It belongs to the Wernher-Beit-Eckstein group, and S. Richards is the manager. During the year ended July 31, 150,329 tons of ore was raised, and after the removal of 35% waste, 98,196 went to the mill. The average number of stamps in operation was 85 out of 100. The total production of gold by amalgamation and cyaniding was 43,953 oz. or 8.95 dwt. per ton of ore milled. At this mine sorting both below and at the surface is done closely and the policy of large output and low cost is not adopted. In addition to the mine ore, 24,014 tons was taken to the mill from the dump, and 40,382 tons of accumulated slime was treated by cyanide. The total expenses were £155,276, and the profit was £62,435. The dividends absorbed £40,000. With regard to the future of the property, Mr. Richards estimated the reserve on July 31 at 63,523 tons, but anticipates that as much again will be ultimately available from new ground and from old stopes; 6000 tons of old dump is profitable, as also is 42,000 tons of accumulated slime. As already reported, negotiations are in hand for the joint working of the Jumpers and the Treasury mine, whereby the former will conduct the remaining operations and take two-thirds of the profit.

General Mining News

ALASKA

(Special Correspondence.)—There is considerable excitement at Nome and throughout Seward Peninsula over the new finds on Squirrel river. A tributary of the Kowak or Kobuk river, which empties into Hotham inlet on the east side of Kotzebue sound. Gold has been found along Cleary creek, a tributary of the Squirrel, for a distance of four miles, and sluicing operations during the latter part of this season have disclosed rich ground. From $100 to $300 per day per shovel has been mined. The gravel beds are shallow, being from five to eight feet deep, and the gold is coarse. I have recently seen two pokes of Cleary creek gold, worth about $15,000, which were brought to Nome by H. Greenberg of the Bessie claim. This gold was in nuggets ranging from five cents to $100, and I was informed that this represents the run of gold as taken from the sluices. There are deep deposits of gravel on the benches of the streams, and prospecting for ancient channels is now being conducted by those who are wintering in the camp. About 400 miners are in the vicinity of Cleary, and others are now on the way there. Gold has been found on four creeks, but Cleary is the only one upon which sluicing has been done. This stream is about twenty miles long, and all of its gravel is believed to be gold bearing. Baldwin creek is of about the same length as Cleary, and good prospects are said to have been found on this stream also. Nome miners who have visited the district predict a great future for it, some going so far as to say it will be a better camp than Nome ever was. About $60,000 worth of gold was mined there in a short time just before the freeze-up this fall.

Nome, November 1.

(Special Correspondence.)—The steamship *Peterana* took a 2000-ton cargo of ore from the Mt. Andrew mine, on Prince of Wales Island, last week to the Tyee smelter at Ladysmith, B. C. This ore samples high in iron and carries some copper.——Sheppard & McKenzie have started development work on their property on Dall bay.——The Pacific Metals Co. has a force of men on the Dean property cross-cutting toward an ore-shoot at the 90-ft. level. W. L. Polson is now superintending the work, succeeding John Hampson, who has gone to England.

Ketchikan, December 1.

The gold shipped by Alaska operators to the U. S. Assay Office at Seattle for the month of November 1910 amounted to $1,558,234.57, as against $722,780.67 for November 1909. It is noted that the 1910 operating season was considerably longer than previous seasons.——The mail and passenger route between the sea coast and Fairbanks is now from Cordova instead of Valdez, as formerly. The change was brought about as the result of building the railroad from Cordova a distance of nearly 100 miles up the Copper river. ——A custom stamp-mill has been built and put in operation at Chena, at a cost of $25,000. It is to operate on gold-bearing quartz mined in the hills near Chena and Fairbanks.

ARIZONA

COCHISE COUNTY

The Centurion mine, situated half a mile from Dragoon station, has been opened to a depth of 425 ft. on a vein said to be at the contact of limestone and porphyry. The vein strikes north and south, and has a dip of about 57°, the ore consisting of azurite, malachite, and chalcocite, with some native copper. It is claimed there are 5000 tons of ore on the dump, assaying higher than 3% copper. Contracts have been made with the owners of the smelter at Benson for treating this ore, as it is said that plant is to be operated again.——At the Copper Queen smelting plant, at Douglas, work has commenced on two reverberatory furnaces, and six McDougall roasters. Extensive additions are being made to the flue-dust chambers. Construction improvements are also to be made this year at the smelting plant of the Calumet & Arizona Copper Company.

GRAHAM COUNTY

The Arizona Copper Co. is [illegible] the capacity of one of its outputs [illegible] 500 to 1,000 tons daily. A new working [illegible] close to the mill to be [illegible]. For this work [illegible] new equipment will be required. ——The Twin Peak M. Co. is to build a power plant at York station, and transmit power to its mine and mill.

MARICOPA COUNTY

The United Verde Extension near Jerome is being developed from an 800-ft. shaft. A level driven from the 800-ft. station has opened an extensive body of copper sulphide and farther on a deposit of carbonate ore. A winze was sunk 200 ft. from the 800-ft. level, and driving from the bottom of the winze is progressing to cut the same orebodies that were opened upon the 800-ft. level.——The Lincoln mine, situated in the Bradshaw mountains, has been sold by C. J. George and associates, to Miller and associates, who formerly operated at Goldfield, Nev. The mine has been considerably developed, and is equipped with a mill. The purchasers have a force of men at work in the mill and mine preparing to resume regular work. It is claimed the purchase price was $100,000.——Churn drills are to be brought into use in exploring the holdings of the Cumberland M. Co., situated in Turkey Creek district. People of Des Moines, Iowa, are in control of the company.

YUMA COUNTY

A rich vein of ore has been discovered in Old Woman mountains, 16 miles from Milligan station, east of Parker, and locations covering it have been made by A. B. Day and Scott Price, whose assays of the ore show that it runs high in silver, with considerable copper, lead, and gold. Many other prospectors have gone into the new district to make locations.

CALIFORNIA

BUTTE COUNTY

Cohn & Goodday, purchasers of the Mineral Slide placer mine, near Magalia, have adopted the Moody amalgamating table to use in place of the sluice-boxes. The table was devised by S. P. Moody, and it is claimed that 95% of the gold is recovered by it.

CALAVERAS COUNTY

(Special Correspondence.)—The Standard Amalgamated Exploration Co. is building a chlorination plant at its Economic mine, of which Oliver Reece has charge. V. M. Weil, general manager for the company, recently arrived at the property from Boston.

San Andreas, December 3.

INYO COUNTY

The Southern Belle mine near Bishop is to be operated again, this time under bond to R. R. Hill of New York, and with A. E. Vandercook in charge of the work.——The Mollie Gibson, situated in the White Mountains, is being developed by Denver people. Some rich gold ore has been found.

(Special Correspondence.)—A. R. Short and associates of San Jose, who recently leased the Cerro Gordo mines from the Four Metals Co., are working a force of 15 men and expect to commence ore shipments within 30 days. An excellent orebody has been opened on the eleventh level.——The Mortimer M. Co. of Philadelphia, having a property 12 miles from Lone Pine, has developed some good ore, and may build a 20-stamp mill and equip it with amalgamating and concentrating machinery next spring. A. B. Bell is general manager.——The Buckeye M. Co. has suspended operations pending an overhauling and alteration of the plant.——Eastern capitalists have bonded the Chrysopolis group and are installing a 10-stamp mill. Good bodies of ore are said to have been developed.——The Minnietta has resumed shipments of silver-lead ore. John Gunn is directing the work.——Operations have been resumed at the Keynote, 12 miles east of Lone Pine, on which developments will be carried on at greater depth.——Development work is in progress at the Ville Real, seven miles from Darwin.

shows rich silver lead ore was recently found by D. F. Shockley. Samples of the ore are said to assay 60 lead and 12 oz silver per ton. The property is thought to be on the line between the Green Jacket and Brown mines. The vein is over 5 ft. wide at the point of intersection. The entire Lone Pine District has shown renewed activity with the completion of the new branch of the Southern Pacific.

Bishop, December 1.

KERN COUNTY

The Wreck mine, close to Randsburg, has been opened to a depth of 400 ft. and has considerable ore on the dump. Some of the richer ore has been milled at a custom plant. It is the property of John Singleton. The Butte is crushing ore that yields $20 per ton. Some good mining ore is also being taken from the Zachary lease on the King Solomon vein, a small shipment of which yielded $100 per ton at a local mill.

NEVADA COUNTY

The Grover Murphy gravel mine, west of Nevada City, has been sold to the Hancock company which has been operating it for the past two years. The first payment to Grover was made on R. D. Stevens, Warren who came from Honolulu, the new owners were New- ton F. Hyatt, Mrs. K. M. Williamson, Frank Van Wormer and W. D. Murphy. Since the engineers have had possession of the mine they have spent $20,000 in development work and the results of recent tests have been very satisfactory. The property is equipped with a hoist, pumps and all accessories. At one drift which was made on a depth of 200 ft. and from which 6,100 ft. of tunneling on the right. The purchase price was $75,000. The Waterloo Mine, which the Bridges Bros. had leased to Lake Frisbee and others, is a producer at frequent spots. The property as do the properties which Andrew Nash, of Oregon, has a 100 ft. shaft, which is to be sunk to a depth of 400 ft. Nothing in the operations has been announced.

PLACER COUNTY

The Oregon Mountain Gold Mining Co. of Dutch Flat, which has been idle for several years, has been reorganized by other interests as the Oregon Mines Gold Co. and will begin operations on its property at once. The old mill has been dismantled. The new mill will be of 100 tons capacity. The Mountain Gold Mining Co. of Dutch Flat, which has been idle for several years, has been reorganized by other interests as the Oregon Mines Gold Co. and will begin operations on its property at once. The old mill has been dismantled. The new mill will be of 100 tons capacity.

PLUMAS COUNTY

N. A. Sawtelle has given a bond and lease on the Mexico Gold mining property to Dexter Bennett of Minneapolis. The property is situated on Spanish Creek, about 12 miles from Quincy, and consists of 160 acres. It is developed by a 150-ft. shaft on the vein, by which considerable ore has been extracted. Bennett has taken a contract on the property to

SIERRA COUNTY

The Gold Bug mine, near Sierra City, has been closed down for the winter. The mine has been worked by a small force of men during the past season and has produced a considerable amount of ore. The mine is owned by a local company and is said to be in good condition.

TUOLUMNE COUNTY

The Wreck mine, close to Randsburg, has been opened to a depth of 400 ft. and has considerable ore on the dump. Some of the richer ore has been milled at a custom plant. It is the property of John Singleton. The Butte is crushing ore that yields $20 per ton. Some good mining ore is also being taken from the Zachary lease on the King Solomon vein, a small shipment of which yielded $100 per ton at a local mill.

NEVADA COUNTY

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LAKE COUNTY

J. B. Moore and George Hughes, owners of part of the Elk Basin, in Lake gulch, have commenced the work of opening the property. Recently they struck an 18-in. vein of very good grade ore, assaying $50 per ton. This was found by crosscutting an old shaft on the property. It is thought this vein is the one that has been followed on the surface by Bowers & Bishop, who, along the Good Gold on Half Moon gulch, have developed a valuable outcrop. The ore in which assays $40 to $100 per ton. The ore being mined by them is carried by pack animals down to the wagon road, as the mine is on a steep mountain side. A small shipment to the smelter has been made.——Burton, Plank and Kirk Wells are shipping 60 tons daily of the concentrate ore from the Hardtack shaft on Fryer hill. It is said to run 40% zinc. An electric hoist is being put in at this shaft.——The Seneca or Stray horse gulch is being operated by Burton & Dudley, who are installing at the Seneca shaft an electric hoist. They expect to find zinc carbonate ore.

OURAY COUNTY

The American Nettie mill, built in 1901 by the American Gold M. Co. and which was idle for a long period is now in the hands of the Wanaoah M. Co. This company has rebuilt and modernized the mill and started it in operation on ore from the Bright Diamond mines. The mill is now equipped with a 9 by 15 in. Blake crusher, picking table, 24 stamps and 8 Wilfley tables, and has the capacity of 75 tons per day. The mine is said to have considerable ore accessible, the metals being gold and silver. G. H. Barnhart is the company's manager.——A company of Boston men has commenced the work of erecting a smelting plant at Red mountain, the equipment for which is to be supplied by the Traylor Engineering Co. The persons identified with the smelting enterprise have acquired the Saratoga, Alvarado, Mono and Baltic mines in the Red Mountain district.——The Carey Brothers have a lease on the American, Nettie and O. & N. mines at Ouray, from which ore is being taken and milled at a small plant recently erected. F. O. Seaberg, long identified with these properties, is manager.——Lessees on the Khedive are reported to have opened a large body of valuable ore.——The Atlas mine in Sneffels district has not only been developed through the San Pedro adit, but through other openings. It has big bodies of ore and its mill is in successful operation.——The Revenue, up toward Mt. Sneffels from the Camp Bird, has a force of 240 men, the greater number of whom are on development work. The mill is being repaired and changed in some particulars.

SUMMIT COUNTY

The Standard mine, on Gibson hill, which is being operated by M. A. Wright and others, shipped to the smelters a car of ore that sampled $90 per ton in silver, lead, and gold. Other shipments are to follow.——The Pfister-Smith lease on the Bulwer lode, Nigger hill, near Breckenridge, is now productive. An 18-in. vein of galena and lead carbonate was recently opened as the result of driving from the bottom of a 60-ft. shaft.——Two carloads of sacked concentrate was shipped in November from the Arctic mine, on North Star mountain. E. P. Jones has charge of the mine and mill. The ore assays well in gold.——In operating the Reliance gold dredge on French gulch the buckets cut into the bedrock and scraped up some high-grade galena from the bedrock cropping of a vein of that kind of ore.——The clean-up of the Reilling dredge, made the last week in November, amounted to over $[illegible]. It was anticipated that the following week's clean-up would exceed this. H. J. Reilling is directing these operations.

TELLER COUNTY

The Golden Cycle M. Co., operating near Goldfield, in Cripple Creek district, declared a dividend of one cent per share November 1, and another of two cents per share payable December 1. It is reported that this company is considering the plan of building an aerial tramway from Cripple Creek to its mill at Colorado City.——It is reported that a custom milling plant, in which the Pertrand process is to be adopted, is to be built in Cripple Creek district.

IDAHO

BOISE COUNTY

(Special Correspondence.)—The Centennial Mine & Milling Co., which has been operating over on the ridge, extracting ore from the north end, placer mining on Grimes creek, recently secured the grant of a water right and has since then completed the building of an electric power plant on the Payette river, at a site 9 miles from the mining property at Centerville. It is anticipated that the power will not be accomplished before July. The company has completed a system of 6.8 miles of flumes to carry water for hydraulic placer mining which is to be started on Grimes creek next spring.

Centerville, December 5.

MISSOURI

JASPER COUNTY

(Special Correspondence.)—Preparations are being made throughout the district to reopen and properties which have been idle for some time. In the Webb City field the old

Prospecting at Joplin With a Keystone Drill.

Electric mine on the Guinn land is to resume operations. It is a sheet ground property operating on rather thin dirt at a depth of 200 ft. The new company will enter the ground through the old incline shaft.——The old Holdout mine in the north Webb City sheet field is to be operated again under the management of the American Canadian Co. The dirt is taken from the 175-ft. level. Zinc blende and no lead is found.——The Providence company has taken over the Siegfried mine on the Newell Morris land south of Webb City and will begin operating. During the idleness the drifts filled with water and pumps have been installed to unwater them. A number of drill holes have been put down and the deposit blocked out.——Joplin operators have taken over the Potter tract west of the Missouri Pacific station in Carthage and have installed pumps to drain the property. Ore is rich here, lead being found at a depth of only 70 ft.——The operators of the Prairie Chicken, southwest of Joplin, are driving south from the new shaft and have connected with the old drifts. Ore is being taken from the 200-ft. level, where it is mainly zinc

blende, with a small percentage of galena. The old tailing from this mine is also being worked by a leasing company. ——A 100-ton tailing mill is being built on the Lone Elm land of the Granby company. This mill will re-work the tailing from the 430-acre tract. It will be the first to operate in this part of the field for many years. The tailing is thought to contain a good percentage of metal. There are also numerous crush piles which were imperfectly treated by hand-jigs, and it is believed they will yield some ore.——A mill of 100 tons capacity is being built on the Saddler tract, south of Duenweg, to handle the calamine which is being found there in abundance. This ore is being taken from the 123-ft. level, and formerly was treated on hand-jigs. An ore face 40 ft. wide has been uncovered in one drift. Before building the mill the ground was thoroughly tested. In addition to calamine, there is some free lead ore in large chunks, easily prepared for the smelter. ——There is some activity in the Carl Junction camp. The Homestake mine has a new mill to be started at once. Before the work was planned the tract was most thoroughly prospected and the mineral extent determined.

Joplin, November 28.

NEVADA

CHURCHILL COUNTY

The work of building the mill at the Nevada Hills mine, at Fairview, is progressing rapidly under direction of J. B. Fleming, mechanical engineer. The plant is to have the capacity of 100 tons daily, and is being equipped for processes similar to those adopted in the mill of the Goldfield Consolidated. A steel head-frame is being erected at the principal shaft. W. H. Weber is manager for the Nevada Hills Con. M. Co., the controlling stock in which is owned by George Wingfield.

EUREKA COUNTY

The Eureka & Palisade railroad, and property connected with it, were purchased at foreclosure sale last week by George W. Heintz, general manager for the United States Smelting, Refining & Mining Co. The road has a length of 86 miles, extending from Palisade to Eureka, and has not been in operation since last March when serious damage to the property by high water occurred. The United States company owns the old Richmond-Eureka mines at Eureka, the ores of which consist of lead-carbonate, associated with iron, with sulphide ore in the lowest workings. It is assumed that this company may rebuild the railroad to make this lead-iron ore available for its smelters.

LINCOLN COUNTY

Reports published at Salt Lake are to the effect that the Pioche mining properties of the Nevada Utah, Consolidated Pioche, and Prince Consolidated are likely to be merged under one organization. It is understood that a definite basis of consolidation has been agreed on, and that the proposition is ready to be submitted to the stockholders of the three companies concerned. Among those who attended a meeting to arrange the terms of the proposed merger were Ernest R. Woolley, Ernest L. and Anthony H. Godbe, and Jas. L. Hackett. The successful termination of these negotiations probably will be followed by activity on a large scale in Pioche district.

NYE COUNTY

(Special Correspondence.)—Companies owning property surrounding the Tonopah-Belmont, encouraged by the development in the latter which has placed it in the first ranks of Tonopah producers, have resumed development work after several years of idleness.——The Mizpah Extension, adjoining the Belmont on the north, after sinking 1000 ft., is now driving north from the 1000-ft. station. The shaft is in rhyolite, but the drift is expected soon to enter the andesite, or lode-bearing formation, as the Belmont shaft passed through the rhyolite at about 850 ft. The driving progresses slowly, as it is being carried on by hand drilling. A compressor for air-drills is soon to be installed, however.——The Rescue-Eula, south of the Belmont, has repaired its shaft and started development. The lower levels are in the lode-bearing andesite, and a drift on the 600-ft. level connects with the Belmont workings. ——The North Star shaft, directly north of the Belmont's Desert Queen shaft, is being put in order after an idleness of three years. This property has several proved veins of fair promise.——The last property to resume work is the Belmont Extension, owned in part by George Wingfield. It lies southeast of the Belmont and adjoins the Rescue. The surface plant, head-frame, and top sets of the shaft were destroyed by fire some time ago, and these are being replaced so that sinking can be resumed at the present depth of 425 ft.——The Jim Butler Co. has commenced repairing the surface plant at the Stone Cabin shaft in which a skip is to replace the crosshead and bucket. Driving will be started southeasterly on the 600-ft. level, to be continued beyond the Stone Cabin fault into virgin ground. ——The Montana-Tonopah has declared a 6-cent dividend, payable December 20; and Tonopah-Belmont has declared a 15-cent dividend, payable January 15. In October the net earnings of the Tonopah were $165,000, those of the Belmont being $102,000. The Tonopah has discontinued work on the Sand Grass shaft, except that two diamond-drill holes are being put down on the claim to find the depth of the later andesite capping, and to prospect the lode-bearing earlier andesite.

Tonopah, December 1.

WHITE PINE COUNTY

The shaft of the Giroux Con. Mines Co., at Kimberly, is being sunk from 1300 ft., its present depth, to 1400 ft. Cross-cuts from this shaft east to the Alpha orebody have been driven from the 1000 and 1200-ft. stations, and a similar cross-cut is to be driven from the 1400-ft. station as soon as the shaft shall have reached that depth. The length of these cross-cuts is about 750 ft. By this system of opening it is planned to explore thoroughly and develop the orebodies. This company has appealed to the Interstate Commerce Commission to have established a through freight rate from Chicago and Missouri River points to stations on the Nevada Northern. The company probably will not proceed with the building of a smelting plant at Kimberly until this rate question is settled. It is the local rate over the latter road that is complained of as being excessive.——The Steptoe Valley S. & M. Co., a subsidiary of the Nevada Consolidated, which operates the big concentrator and smelter at McGill, is now concentrating between 8000 and 9000 tons of ore daily from Copper Flat. Three basic-lined converters are being installed in the converter building at a cost of $120,000.

NEW MEXICO

GRANT COUNTY

The Chino Copper Co. acquired its present holdings of 2800 acres in 1909. Included in this area is the old Santa Rita copper mine, operated a century ago by Spaniards. It is regarded as the oldest copper mine in the United States. Its location is close to Santa Rita, east of Silver City. The ore is disseminated through porphyry and quartzite, in which the company has developed extensively. Its ore reserves on November 1 were estimated at over 30,000,000 tons, which, according to sampling, assays 2.6% copper. To concentrate this ore the company is erecting a plant of 3000 tons daily capacity at Hurley, nine miles from the mine. The Santa Fé railroad branches extend to Silver City and Santa Rita from Deming.

OREGON

GRANT COUNTY

The Red Boy Mines Co., owning the Red Boy mine and mill, situated four miles from Granite, has increased its capital stock from $1,000,000 to $1,400,000, and authorized the issuance of bonds in the amount of $150,000 for the purpose of paying the indebtedness of the company, and creating a fund for further development. The lower workings are kept drained and the plan is to sink 300 to 500 ft. deeper and explore the orebodies from the lowest station.

JOSEPHINE COUNTY

Activity in placer mining is reported in the vicinity of

Kerby and Waldo to Illinois valley. Hoisting equipment has been put in place at the Deep Gravel mine at Waldo and in prospecting the Greenback gravel bank pay ore has been found at a lower depth than heretofore. A house and other equipment have been moved out to the mine. Property consists of the Alameda Mining Co. which owns and smelting plant at Grave ree on the National Forest had to give a bond of $10,000 to cover any damage to the standing timber in that vicinity that may result from smelter fume. This bond being given the District Forester granted a special permit whereby the smelting furnace may be operated. The Blalock placer mine situated near Placer has been leased to John Willfrout and son who have put in some new hydraulic pipe. They have commenced operating. ——The Scandinavian American Dredging Co has been organized to dredge for gold the bars and banks of the Rogue river. P H Holdsworth W L Hunter Joseph Slumpf, W. Martin, and others of Seattle are the organizers. It is stated that a dredge has been purchased, and that it is being installed near Grants Pass.

UTAH

JUAB COUNTY

Ore shipments from the mines of the Tintic district, for the week ended December 3, were as follows: Centennial Eureka, 53 cars; Chief Con., 5; Dragon, 15, Sioux Con., 8, Iron Blossom, 19, Colorado, 9, Opohongo, 1; Grand Central, 4, Uncle Sam, 5; May Day, 3; Gemini, 3; Iron King, 3; Yankee, 1; Gold Chain, 7; Scranton, 4, Ridge & Valley, 3, Eagle & Blue Bell, 1, Mammoth, 1; total, 125 cars. In addition to this, the May Day shipped one car of concentrate. The Tintic mines are mostly in limestone, which forms the Tintic range. A number of the mines have been opened to a depth of over 2000 ft., notably the Centennial-Eureka, Mammoth, and Grand Central. In the Centennial-Eureka shaft water-level was found at 2200 ft., and at this station electric pumps were set. This property belongs to the United States Smelting, Refining & Mining Co., while the Iron Blossom and Colorado belong to Jesse Knight; the Uncle Sam and May Day are owned by companies of which John Dern is general manager. The Gemini, one of the oldest mines in the district, is owned by the J. Q. Packard estate, and is in charge of McChrystal Brothers. The Chief Con., one of the newer properties, is in control of Michigan operators, for whom Walter Fitch is manager. The Chief shaft has reached a depth of about 1700 ft. The ores of the district carry lead, silver, copper, and gold. The Mammoth is especially noted for the large amount of gold in its ore. The towns of the district are Eureka, Mammoth, Robinson, Silver City, and Knightville, all of these except the last having connections with the San Pedro and Rio Grande railroads. Years ago there were four or five concentrating plants operating in the camp; now there is but one—that of the Uncle Sam. Moderate freight rates, and nearness to smelting centres, apparently have made concentration unnecessary.——The Colorado M. Co., controlled by Jesse Knight, mined and shipped 25,654 tons of ore during the last year, of a gross value of $823,217.49; net value, $579,209.91. The metals extracted from this tonnage of ore consisted of 4842.66 oz. gold, 919,841.09 oz. silver, 10,177,904 lb. lead. Dividends for the year were $400,000.

SALT LAKE COUNTY

The sixth reverberatory furnace, 300 tons daily capacity, is ready for use at the plant of the A. S. & R. Co. at Garfield; and another copper converter is almost ready to be operated.——Six sections of the Arthur mill of the Utah Copper Co. are being remodeled; the Nissen stamps are being replaced by Chilean mills. When finished the plant is expected to have the capacity of 7000 tons per 24 hours. This is what was formerly the Boston Con. mill. The capacity of the Utah Copper Co.'s Magna mill has been increased to nearly 13,000 tons daily.——A late report made to the stockholders of the Utah Con. M. Co. by that company's consulting engineer, gave an estimate of the ore in sight at 300,000 tons, averaging 2.32% copper, 0.05 oz. gold, 0.85 oz. silver. Recommendation is made that ex-

[illegible] and development [illegible] to be carried out to open [illegible] ground for the purpose of [illegible] a [illegible] scale of [illegible] of concrete. The above estimate of [illegible] seems disappointing as [illegible] Utah has given a much better [illegible] The mine of the company is known as the Highland Boy and is situated on the upper end of Carr fork in Bingham district. A considerable expenditure was made this year in the construction of an aerial tramway from the mine to the plant of the International Smelting & Refining Co. near Tooele.

SUMMIT COUNTY

A system of leasing has been adopted at the Daly West. Daly Judge and other mines of Park City district, which is said to be proving satisfactory to owners and lessees. The Daly Judge M. Co. guarantees wages to lessees but as a rule the latter make much more than the established wage. The plan is to let leases on small bodies of ore which cannot be worked by the company at much profit but on which the lessee often can do well. When work on those small veins leads to a big body of ore, however, the company reserves the right to cancel the lease and work it on its own account.

WASHINGTON

FERRY COUNTY

The Republic Mines Corporation paid a dividend of $15,000 on November 28, which makes a total of $85,000 paid since June. In the meantime $200,000 has been paid on the purchase price of the mines, leaving a balance of $25,000, which probably will be paid before the end of the year. The money necessary to meet the above payments of $285,000 was part of the proceeds of ore sold since last January. The ore produced was taken from the Lone Pine, Surprise, and Pearl claims in Republic camp. The property was acquired from the Pearl Con. M. Co. of Spokane. J. L. Harper has been manager for the Republic Mines Corporation since the purchase was made.——The Beecher mine, situated near Orient, has been reopened. The 2-compartment shaft has been cleaned out, and mining commenced. This is a gold mine that formerly produced high-grade ore.

CANADA

BRITISH COLUMBIA

(Special Correspondence.)—The Granby Con. Mining, Smelting & Power Co., operating at Phoenix and Grand

Hidden Creek Copper Mine.

Forks, has taken an option on the controlling interest in the stock of the Hidden Creek Copper Co. at $400,000, and has made a substantial payment. M. K. Rodgers of Seattle is the minority stockholder. A force of 25 to 30 men is employed at the mine and development is to be continued through the winter. The property is situated on Observatory Inlet, in the vicinity of Portland Canal.

Prince Rupert, December 1.

(Special Correspondence.)—The intention is to continue shipments from the Aurora mine, at Moyie, all winter. The ore is being concentrated, the silver-lead product going to

Texas shaft. The ore concentrate is to be shipped to the United States. The power engine is to be moved to the back creek. The Eureka group, near Texas, now owned by J. L. Smith, is said to have $5 to $7 per ton in the adit that will assay $55 gold. In the shaft $ ft of ore has been cut which assays 70% lead and 20 oz silver. Over $12,000 has been spent on the property. Preparation is being made to ship ore. The Van Roi mine has closed down, pending the building of the new concentrator. A find of rich silver ore has been made on the Sweetgrass being operated under lease. A find of good ore is reported from the Noble Five property. A 3-ft vein has been opened on three levels. It is with regret the mining men in the Kaslo district learn that the C. P. R. does not intend to take over the K. & S. Ry. from the Great Northern. The Government is negotiating with the G. N. Ry. in an effort to get the line reopened. A discovery is reported on the Granite-Poorman near Nelson. The main vein on the Greenhorn claim has 350 ft. of backs. The ore has averaged $12 in a 2- to 3-ft. vein. An adit is to be driven on the Eureka Sheep creek to open the seven veins on the property. A force of men is at work making a road to the proposed Mother Lode millsite on which a 20-stamp mill is to be erected. The shipments of ore and concentrate from the Slocan-Kootenay district for the week ended November 19, 1910, amounted to 1614 tons, of which 1024 tons was shipped from the Sullivan mine.

Nelson, November 25.

ONTARIO

(Special Correspondence.) E. M. Flynn, general manager for the Porcupine Gold Mines Co., has gone to New York. He stated that reports from Porcupine greatly exaggerated the impassable condition of the trails, that the recent frosts have hardened the ground, and later frost and snow have made good sleighing. It is now possible to drive from Kelso, the point of departure from the T. & N. O. railway to Crawford's Landing. The lakes and rivers are not yet frozen enough to allow teaming, but they are now teaming on the government road from Hell's to Porcupine. A floating bridge is being constructed across the Frederickhouse river, and it is only a question of a few days before it will be possible to drive through from Kelso to Porcupine. On the two McKay veterans of southwest Tisdale, which were taken over by the Wadunat Syndicate, two veins have been discovered. The mill at the Porcupine Gold Mines Co. will be in operation in about two weeks. The main working shaft is down 95 ft., and it is expected the main crosscut will be reached and a station cut at 150 ft. within two weeks. The Malder-Moorhead group of claims a mile south of Tisdale township, has been sold at a price said to be $250,000. The Jones group in Dundonald has been sold for $150,000; the two Krug claims in the northwest corner of Shaw for $50,000, and the three Foster-Ellis claims in Shaw township have been sold to the Temiskaming & Hudson Bay Co. for $35,000. The reports of a discovery on the Penny veteran in Whitney township have been confirmed. A vein 100 ft. in length, with many exposures of free gold, has been discovered. It is reported that important discoveries have been made on the Power group in Deloro south of Lot 7, in Tisdale, where a vein 22 ft. in width, with rich gold ore, has been discovered. — A. H. Chisholm, superintendent for the Porcupine Gold Ridge Mines Co., expects to do secretary of the Porcupine Mine Owners' Association, today that the recently discovered quartz vein, in the southeast section of the property, near College line, S. from S. to 2 P. is wide. The ore-body was well defined and gave returns, which showed free gold. Six samples carried from 5 to 60 ounces. Ores were sent to Rickard & Parks, which showed an average of 1.94 oz. of gold per ton, or $40 per ton. Rickard & Parks also reported that the ore was free-milling in the crushed portions of the ore. The Gold Ridge Mines Co. is capitalized at $1,000,000, and has a treasury which is reported to be ample to carry on development work for a year. They are planning to

Porcupine, December 1.

Technical Schools and Societies

The Colorado School of Mines Quarterly for October, issued at Golden, deals ably with the Scope and Progress of the Mining Industry in Colorado.

The Indiana Academy of Science held its twenty-sixth annual meeting at Claypool hotel, Indianapolis, November 25. The program was of much interest.

The State Geological & Natural History Survey of Wisconsin has issued a relief map of the State, showing topography, geology, drainage, railroads, county lines, and cities.

E. R. Buckley, geologist for the Federal Lead Co., lectured at the Missouri School of Mines, on November 7, on "The Geology of the Disseminated Lead Deposits of Southeast Missouri."

H. A. Buehler, director of the Bureau of Geology and Mines of the State of Missouri, lectured to the class in economic geology in the Missouri School of Mines on October 17 and 19 on the "Origin of Zinc Deposits of Missouri."

The Utah Society of Engineers held a regular meeting on the evening of October 31, at which a paper on "Manganese Steel" was read by F. E. Johnson. Members of the Society visited the plant of the International Smelting & Refining Company.

A number of former students of the Michigan College of Mines met at a banquet in Chicago recently and formed there the Michigan College of Mines Club. The officers are E. C. Reeder, H. H. Hopkins, F. O. Williamson, and E. K. Stevenson.

The School of Mines of the University of Washington, at Seattle, has arranged a three-months course for mining men this winter, which includes instruction in stamp-milling, concentration of ores, assaying, drafting, sampling ores, geology, and surveying.

The University of Idaho, at Moscow, mining department, has been equipped for assaying, ore dressing, and metallurgical tests. An eight weeks course has been established for the benefit of those who cannot take the regular course in mining and metallurgy.

The Society of Arizona Engineers was organized at Phoenix last month with the following engineers as officers: W. A. Parish, Phoenix, president; Geo. J. Kosbruge, Tucson, vice-president; M. Gerold, Phoenix, secretary; P. P. Parker, Phoenix, treasurer.

The Zacatecas Mining Association held a meeting at Zacatecas, Mexico, November 17, at which the question of having a geological survey of the district was discussed. The next meeting is to be held December 21. J. F. Barry, Mine La Fe, at Guadalupe, is secretary.

The School of Mines of the Pennsylvania State College, co-operating with the mining branch of the State Y. M. C. A., has undertaken mining extension work among the coal miners of that State. This includes lectures on mining topics and these are printed and distributed.

At the School of Mines of Pennsylvania State College the following appointments have been made: H. D. Pasmore, of the Case School of Applied Science, to be instructor in metallurgy; Victor Ziegler, of Iowa University, and P. Columbia University, to be instructor in geology and mineralogy.

Utah Copper Co. is producing copper at the rate of 50,000,000 lb. per year, and for 1910 the total output is expected to reach 100,000,000 lb. Earnings for 1910 are estimated at $5,000,000. Nevada Consolidated dividends are now paying at $[illegible] per [illegible].

Nipissing Co. expects production of copper at Cobalt to [illegible] 000,000 lb. [illegible] increase from Seymour [illegible] Timiskaming [illegible] the first [illegible] months of the year amounted to [illegible] tons of copper.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS

RELOCATION OF PLACER CLAIM

Where locators of a placer mine are at most in constructive possession only their location must be strictly legal and valid to be effectual against a person who seeks to relocate the ground.

Saxton v. Perry, (Colo.) 107 Pac. 281. Feb. 10.

TITLE TO MINING CLAIM IN PHILIPPINE ISLANDS

The possession and working of a mining claim in the Philippine Islands for the time required by the United States statute in order to establish a right to a patent, need not have been under a claim of title.

Reavis v. Franza, 30 Sup. Ct. Rep. 1. Nov. '09.

BOUNDARIES OF MINING CLAIM—FIELD NOTES AND MONUMENTS

The courses and distances in the field notes, and in the patent of a mining claim are not conclusive of the true locations of the established monuments of the official survey. But a competent witness may testify that he saw and observed the posts and monuments and knew that they were not changed from their original position.

Grand Central Mining Co. v. Mammouth Mining Co., (Utah) 104 Pac. 573. Sept. '09.

VALIDITY OF ENTRY OF COAL LANDS

Under the United States statute permitting the entry of coal lands by a qualified person, in case of an individual, not exceeding 160 acres, and in case of a corporation not exceeding 320 acres, persons cannot lawfully associate themselves together for the purpose of entering tracts of 160 acres each in severalty, but to be held for the joint benefit of all in equal shares, and patents so issued were cancelled at the suit of the United States.

United States v. Portland Coal & Coke Co., 173 Fed. 566. Oct. '09.

ASSESSMENT WORK ON MINING CLAIM—CONSTRUCTION OF STATUTE

The statute of Washington providing that any mining district may make road building to mining claims within such claims applicable as assessment work upon mining claims, on certain conditions therein named, was held to apply only to organized mining districts. But independent of the statute, work done in connection with the claim but outside of it, if done for furthering the development thereof, is available as assessment work as if done within the boundaries of the claim itself; and the building of a road, where there is no organized mining district, to be used in the general development of the mining property, is doing assessment work within the meaning of the law.

Sexton v. Washington Mining & Milling Co. (Wash.) 104 Pac. 614. Oct. '09.

INJURY TO MINER—PROXIMATE CAUSE

A miner while riding out of the mine on the front bumpers of a cable car drawn up a slope, with his arm resting on the top edge of the car, came in contact with a stream of water escaping from a defective joint in a pipe used for pumping water from the mine, supported along the roof of the tunnel, and by reason thereof he was thrown around to one side and his arm was crushed against the roof of the tunnel, which was some 6 in. above the top of the car. In an action for the injury in order to render the mining company liable, it was decided that it was not necessary for him to show that the force of the water was sufficient to physically throw him around and bring his arm in contact with the timber; but that it was sufficient if it caused him to instinctively throw up his arm, and thereby receive the injury.

Tremont Coal & Coke Co. v. Johnson, 172 Fed. 785. Sept. '09.

Book Reviews

Any of the books noticed in this [illegible] or any other book may be procured from the MINING AND SCIENTIFIC PRESS.

TESTING FOR METALLURGICAL PROCESSES. By James A. [illegible]. 126 pages. Indexed. Ill. *Mining and Scientific Press*, San Francisco, 1910. Price $2 postpaid.

The engineer familiar with Western mining camps notes in them everywhere abandoned reduction works. The properties which they were built to serve may have been speedily mined out, but frequently there are those which have never turned a wheel. On further development the mine may have shown no more ore, or the ore has been found to be of too low a grade to work it at a profit. Again, failure may have resulted because the plant was unsuited to the proper extraction of the metals in the ore. To avoid this latter calamity it devolves upon the engineer who has to examine a mine to investigate the best methods of ore treatment, and it is to aid him in making a selection that this book has been written. The author states his problem as follows: "Given an ore or a collection of ores, what are the metallurgical conditions to be attained to result in their most profitable treatment?" The ultimate purpose of the investigation may be for a comparison of fire and wet methods, or for determining the commercial value of an ore." Concentration may be part of an ore-treatment scheme, and first an examination of the ore is made to determine the value and character of the associated minerals and the nature of the included grains. Then laboratory tests are made by jigging and by the concentration of the fine material on tables. If the ore requires it, it may be tested to determine its behavior with magnetic separation, electrostatic separation, or by ore flotation. If the ore contain gold or silver, then it should be determined to see whether it is amenable to treatment by the cyanide process, by chlorination, or by smelting. For the tests a correct sample is of the first importance. Then a preliminary investigation is made of the physical and chemical states in which the gold and silver exist, the fineness of grinding, the presence of heavy minerals suitable for concentration, the solubility of the gold and silver in the cyanide solution, the consumption of chemicals, and the precipitation of the dissolved metals. If the question is as to the relative advantage of cyaniding or smelting, then we must consider the final costs per ton as well as the comparative extractions by either method. In a separate chapter are given schedules of charges and penalties for smelting, so that the engineer may compute the relative advantages of the methods proposed. Thus he is put in possession of all the data from which to determine the most profitable method of treatment.

The book does not altogether confine itself to these matters. It treats also of the instruments and methods of determining the efficiency and performance of furnaces. In blast furnace operations it takes up a discussion of the best composition of slags and details the methods of estimating charges. Finally, the author has collected in a separate chapter cost data of operating and of plant equipment, so necessary for an engineer who has to examine and report on a mining property. The most evident criticism that could be offered upon the book itself would be that the original drawings of the author should have been redrawn before presentation. The low price of the book ($2) may be given as an excuse for omitting this. L. S. A.

PRACTICAL SHAFT SINKING. By Francis Donaldson. Pp. 143. Ill., index. McGraw-Hill Book Co., New York, 1910. Price, $2.

This, the latest addition to the literature on practical mining, will be welcomed by those who contemplate shaft sinking, or who are engaged in such work; particularly those who have unusual difficulties to overcome, where extraordinary methods must be employed, such as caissons, sheet-piling, pneumatic processes, freezing, and the like. The book also gives some valuable cost data and suggestions as to contracts in shaft sinking.

Personal

[illegible]

J. B. Preston is in San Francisco.

J. D. Arnold has gone to Los Angeles.

J. P. Hamilton has a mine in Calaveras county.

W. A. F. Ewing is over on the west side in San Francisco recently.

Lucien Lemmon has returned to San Francisco from Mexico.

R. A. Brown of the Lone Jack district visited Pioche recently.

Thomas Dickson has returned to San Francisco from Nevada.

J. B. Farish has opened a branch office at Porcupine Ontario.

T. W. Ross is at the Keystone mine, Calaveras county, California.

W. A. Hooper is in charge at the Imperial mine near Sumpter, Oregon.

J. D. Hague has returned to Korea, leaving San Francisco, December 4.

F. J. Sumner, manager of the Buckhorn mine in Nevada is in San Francisco.

Ernest MacBorie has returned to San Francisco from the Philippine Islands.

Stanley C. Arthur will hereafter make headquarters at St. Petersburg, Russia.

A. C. Berry is professor of mining engineering at the University of Wyoming.

J. H. Bruce, manager for the Red Bird Mining Co. of Penobscot, is in San Francisco.

E. E. Perry was recently at Grass Valley, California, and is now at Fairview, Nevada.

T. H. Leech is in Gunnison county, Colorado, but will shortly return to his Denver office.

F. Lawson Cranston is at Klamath, Nevada, and will be in San Francisco about December 15.

Edward Hooper has returned to Los Angeles from a professional trip through Arizona and Sonora.

W. H. Trewartha Lewis, general manager for the Tyee Copper Co., Victoria, B. C., is visiting New York.

A. H. Hoernicke has resigned as superintendent for the Whitman Mining Co. at Pearl, Idaho, and is at Boise.

C. O. Mees has resigned the position of superintendent for the Sierra Morena M. & R. Co., Paso Robles, California.

J. Stevens Stock has been appointed consulting engineer for the company operating the Dixie Meadows mine, near Sumpter, Oregon.

Frederick W. Bacon has been made consulting engineer for the Parnell mine at Parral, Mexico, with J. D. Alverson as mine superintendent.

H. V. Winchell delivered an address on the Bloomfield meeting of the International Geological Congress, before the Minnesota Academy of Science, December 6.

Warren A. Fariish, Jr., of McLennan & Farish, has completed the organization of mine work and installation of machine drill equipment at the Keane Wonder mine.

D. C. Jackling of Salt Lake, N. B. McKenzie of New York and A. H. Ryan of Kansas City, members of a party of capitalists who are interested in copper investments in California were in San Francisco this week.

Devin Cole, assistant manager for the Cananea Con. Copper Co., has resigned to accept the position of general manager for the Ray Con. Copper Co., Ray, Arizona, the change to take place January 1.

C. C. Dewey was in San Francisco this week. He has resigned as consulting engineer for the Stevens interests on the Comstock Lode and will open an office at Nevada City for consulting work.

Market Reports

LOCAL METAL PRICES

San Francisco, December 8.

Quicksilver	$42 - $43	Quicksilver, flask	44½ - 46
Electrolytic Copper	13½ - 13¾	Pig	18½ - 19
Pig Lead	4.75 - 5.00	Spelter	7 - 7½

Zinc Dust, 100 lb. crates, per 100 lb., remelt ore 6.50 - 6.75; large 6.75 - 8.50

METAL PRICES

By wire from New York

Average daily prices of metals per pound

Date	Electrolytic Copper	Lead	Spelter	Silver, per oz.
Dec. 1	13.87	4.50	5.00	55
" 2	13.87	4.50	5.07	55
" 3	13.85	4.50	5.01	55
" 4	Sunday		No market.	
" 5	13.85	4.50	5.05	54½
" 6	13.82	4.50	5.01	54½
" 7	13.82	4.50	5.03	54½

ANGLO-AMERICAN SHARES

Quoted from London

	Nov. 10 £ s d	Dec. 7 £ s d
Camp Bird	1 10 3 ex div.	1 10 0
El Oro	1 4 0	1 5 9
Esperanza	1 18 9	1 17 9
Dolores	1 5 0	1 5 0
Oroville Dredging	0 4 4	0 4 0
Mexico Mines	7 10 0	7 7 6
Tonopah	0 18 2	0 18 2

(By courtesy of S. P. Burroughs & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON

	Closing prices Dec. 8.		Closing prices. Dec. 8.
Adventure	8 10	Mohawk	8 142½
Ahmeek	97	North Butte	39½
Alaska	5½	Old Dominion	30½
Calumet & Arizona	68½	Osceola	120
Calumet & Hecla	530	Parrot	42
Centennial	15	Santa Fe	1½
Copper Range	60½	Shannon	11
East Butte	8½	Superior & Pittsburg	19½
Franklin	9½	Tamarack	80
Granby	57½	Trinity	9½
Greene Cananea	8½	Utah Con.	12½
Isle Royale	16½	Victoria	2½
La Salle	7½	Winona	8½
Mass. Copper	7½	Wolverine	115

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS, NEW YORK

(By wire from Curtis & Sanford Co., New York.)

	Closing prices. Dec. 7		Closing prices. Dec. 7
Amalgamated Copper	68	Miami Copper	8 19½
Am. Sm. & R. Co.	70½	Mines Co. of America	6
Braden Copper	19½	Montgomery Shoshone	1-16
B. C. Copper Co.	6½	Nevada Con.	19½
Butte Coalition	18½	Nevada Utah	7-8
Calumet	6	Nipissing	10½
Davis Daly	1¾	Ohio Copper	1½
Dolores	5	Ray Central	1¾
El Rayo	6½	Ray Con.	19½
Ely Central	1-16	South Utah	1½
First National	1½	Superior & Pittsburg	43½
Giroux	6¼	Utah Copper	48½
Guanajuato Con.	⅞	Trinity	6
Inspiration	21½	Tuolumne Copper	6½
Kerr Lake	6½	United Copper	55½
La Rose	5½	Utah Copper	46½
Mason Valley	6½	Yukon Gold	4½

SAN FRANCISCO NEVADA STOCKS

San Francisco, December 8

Atlanta	3 03	Mayflower	9 6
Belmont	4.00	Midway	10
Booth	8	Montana Tonopah	00
Columbia Mt.	1	Nevada Hills	2 12
Combination Fraction	18	Pittsburg Silver Peak	00
Fairview Range	9.	Rochester Coalition	4
Florence	1.00	Rochester Queen	
Goldfield Con.	2.25	Round Mountain	48
Gold Mountain	7	Silver Pick	7
Grand Central	3	Sandstorm	15
Jim Butler	2.	Tonopah Extension	1.05
Lucky Coalition	41	Tonopah of Nevada	2.25
Macnamara	8	West End	50

(By courtesy of San Francisco Stock Exchange.)

OIL DIVIDENDS FOR NOVEMBER, 1910.

From the Official Monthly Statement of Oil Securities of the San Francisco Stock Exchange

Company			Par Value							
[illegible]	[illegible]	[illegible]	$1.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	•	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	•	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The Prospector

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

W. S. H., Hailey, Idaho: Quartzite.

J. W. O., Gibsonville, Idaho: Limonite.

C. T. Dayton, Nevada: Pyrite—no value.

E. A. G., Fort Bidwell, California: Quartz.

J. M. C., Fouts Springs, California: Gneiss.

W. A. D., Landlock Bay, Alaska: Quartzite.

R. P. A., Ely, Nevada: Quartz with manganese dioxide.

J. H. W., Luning, Nevada: Quartz stained with iron oxide.

A. G. McD., Kamloops, British Columbia: Sandstone with limonite.

B. F. N., Ocampo, Chile: No. 2, quartz rhyolite; No. 3, arkose; No. 4, rhyolite.

H. L. R., Cornucopia, Oregon: No. 1, feldspathic rock with graphitic matter. No. 2, diorite.

TIN STATISTICS

L. Vogelstein & Co. report tin statistics published December 1 as showing Straits shipments of about 4800 tons and United States deliveries of 3800 tons. Total supplies exceeded total deliveries and visible supply was expected to increase 1000 to 1500 tons. Considering that this is the dull season of the year and especially in view of the adverse conditions under which the trade in this country has labored, results may be regarded as quite favorable and a good business has been done at advancing prices. Up to December 1 United States deliveries in 1910 increased 3450 tons as compared with 1910; Straits shipments decreased 2400; visible supply decreased 1000; price increased 5¾c. per pound. The rise in price has apparently discounted the improvement—the position alone considered—but the outlook is for continued good demand, moderate supplies, and further shrinkage in visible stocks.

JOPLIN LEAD AND ZINC PRICES

A review of the Joplin lead and zinc market for the week ended November 26, shows that the highest price paid in the district for zinc sulphide ore was $51 per ton, on a base price of $48 per ton of 60% zinc; zinc silicate ore sold on a base price of $24 to $27 per ton of 40% zinc. The average price of zinc ore of all grades was $44.94 per ton. The highest paid for lead ore was $58 per ton, the average of all grades being $56.32 per ton. For the first 11 months of the year zinc ore shipments showed a decrease of 2838 tons, and the lead ore shipments a decrease of 1971 tons from those of the corresponding period last year, the total value of those shipments showing a decrease of $552,113. The shipments for the week from the district were as follows: zinc, 10,002,240 lb.; lead, 1,455,980; total value, $265,784. For 11 months ended November 26: zinc, 540,092,370 lb.; lead, 76,333,670; total value, $12,735,308.

COMMERCIAL PARAGRAPHS

The Edgar Allen American Manganese Steel Co. announces that Walter Brinton, superintendent of the manganese steel department of the Taylor Iron & Steel Co.'s plant at High Bridge, New Jersey, since 1895, has resigned and has accepted a position as consulting engineer for the Edgar Allen American Manganese Steel Co. Mr. Brinton's headquarters will be at the New Castle plant.

The Denver Fire Clay Co., Denver and Salt Lake, has recently put the Donaldson tilting furnace on the market. It is a simple and efficient device for melting and refining cyanide precipitates, gold and silver bullion, brass, copper, lead, and foundry metals. It is made in three sizes and may be adapted for using either gasoline or city gas as fuel. A bulletin descriptive of this furnace has been issued by the makers and is now being distributed.

F. G. Bolles, commercial engineer for the Allis-Chalmers Co., has resigned in order to devote his entire attention to The Reliance Engineering & Equipment Co., 1417-19 Majestic building, Milwaukee, in which he has an equal interest with C. A. Tupper and others. The company, which is taking on a number of additional exclusive agencies, will remove December 1 to rooms 415, 416, and 417 in the new Engineering building, and considerably extend the scope of its operations.

CATALOGUES RECEIVED

American Well Works, Aurora, Illinois. Bulletin No. 118. 'Irrigation by Pumping.' Illustrated. 32 pages. 8 by 10½ inches.

Joseph Dixon Crucible Co., Jersey City, New Jersey. 'Graphite Products for the Railroad.' Illustrated. 44 pages. 5½ by 9 inches.

A. Leschen & Sons Rope Co., St. Louis, Missouri. A pamphlet intended to "provide a means by which a quick selection of quality and construction of wire rope for service other than ordinary may be made without consulting the manufacturers." Illustrated. 24 pages. 5 by 7 inches.

Hayward Digging Machinery. Being catalogue No. 38 of the Hayward Co. of New York. Illustrated. 78 pages. 9 by 12 inches. It is seldom that a more handsome trade publication than this is issued. The illustrations are unusually excellent reproductions of photographs and portray faithfully the many industrial uses of 'digging machinery' as applied to dredging, mining, trench-digging, and the handling of materials. The descriptive text is wholly subordinate. An interesting feature of the catalogue is the fact that the illustrations are from the field rather than the shop.

The Stromberg-Carlson Telephone Mfg. Co., Rochester, New York, has lately re-issued its Bulletin No. 1000 on 'Mine Telephones.' The value of telephone service in mines is coming more and more to be appreciated by operators. Aside from the convenience to managers and superintendents, the added safety which instant communication with all underground workings affords to the miners themselves

makes the installation of a telephone system a necessity rather than a luxury. The expense of equipping a mine with telephones is comparatively small, due to perfection of simple apparatus and standard equipment. The illustration herewith shows the standard type of instrument for underground use as made by the Stromberg-Carlson Telephone Mfg. Co. It is contained in a moisture and gas proof cast-iron box. A special feature is the 'cord take-up' device by means of which the cord on the receiver is automatically taken up when the latter is replaced on the hook. Other interesting features of these telephones, wiring diagrams, and list of mining companies using the Mine-A-Phone system are included in Bulletin No. 1000.

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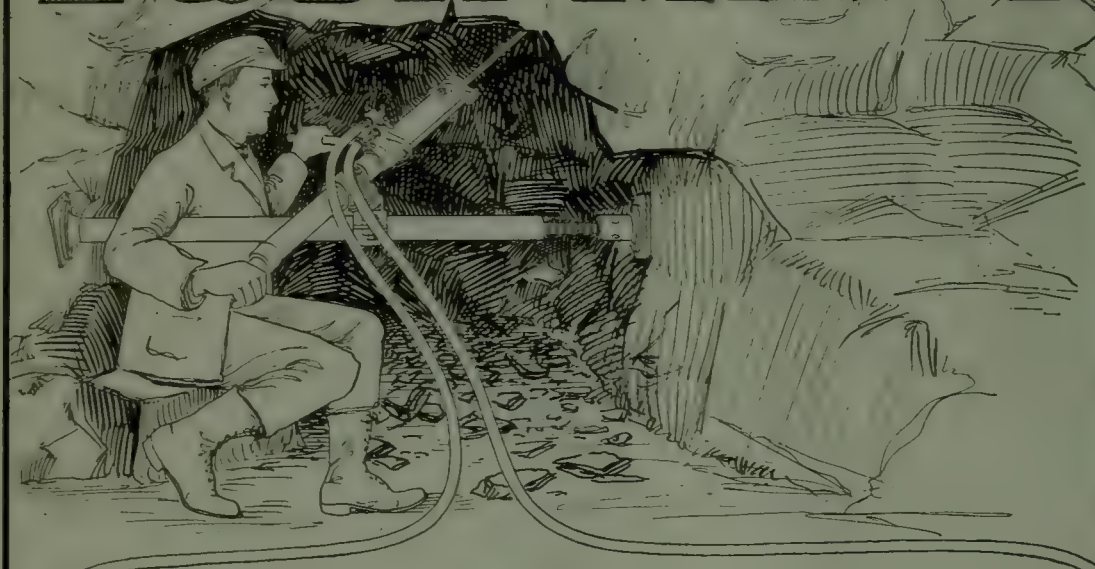

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EDITORIAL

GRANBY CONSOLIDATED has adopted a policy of complete publicity and is now issuing monthly statements of production. The October statement showed 1,184,234 pounds of copper shipped, with $70,092 worth of gold and silver.

AMERICANS are taking an active part in development of the Orient, especially in placer mining. Mr. James J. Martin has just been engaged to develop rich gold placers recently found by the Colbran-Bostwick Development Company near Kapsan, Korea.

EXTRA-TERRITORIAL RIGHTS of foreigners in Korea have not been lost, as has been decided in a test case at Seoul. They are likely soon to disappear, since existing foreign treaties covering the subject expire January 1, except that with the United States. The American treaty extends till 1912. By that time the new regime should be in smooth working order.

CRIPPLE CREEK is already feeling the benefit of the Roosevelt deep drainage tunnel, as is noted in our news columns. Another factor making for prosperity there is the milling of low-grade ore on the ground. The New Portland mill and the Stratton's Independence plant are forerunners of others that will handle ore long sent over the dump. Progress in treatment of Cripple Creek ores was recently discussed by Mr. Philip Argall in an address reproduced upon another page. It will be read with much interest and Mr. Argall is to be congratulated on the starting of the second unit of a great mill.

WHEN Mr. Hoke Smith was Secretary of the Interior he decided that oil was not a mineral. Congress promptly overruled him by enacting that none the less oil land should be taken up under the law provided for placers. Whatever may be said for the theory of the matter, it is now fairly clear that it would have been better not to have attempted to treat oil legally as a mineral. In Ontario it has just been decided, as related in our Toronto letter, that while oil is a mineral, natural gas is not! In arguments over the Indiana gas cases we believe it was held that while gas was a mineral it was at least strongly analogous to wild game and therefore its shipment outside the State could be legally prohibited. All this is doubtless clear to lawyers, but to engineers it would seem simpler to recognize the nature of materials and frame laws accordingly rather than to depend on analogy and fine-spun construction of fundamentally inapplicable laws.

[illegible]

State Geologists

[illegible]

Traveling in Africa

[illegible]

seen the work in progress and not for readers of [illegible] had less interesting account of the trip. The lesson is obvious. Keep going at speed and you will enjoy your work, and by enjoying it will do it better.

The President's Message

The message submitted to Congress December 6 by Mr. Taft is a plain business document in which the activities of the Government are reviewed much as the president of a large and prosperous corporation would present a resume of the year's business to the directors and stockholders. And it is as worthy of being read by each citizen as if the latter were an ordinary stockholder anxious to know what further assessments would be needed to put the enterprise on its feet. The United States Government is in fact an enormous business enterprise, and it is not easy to get an intelligent idea of its income, its expenses, or its work. The President evidently has faithfully studied the reports and recommendations made to him and has succeeded unusually well in digesting and building upon them a systematic, consistent plan. The message is too long either to produce or summarize. We can only touch upon a few points of especial interest to mining men.

The laws relating to mineral lands, excluding coal, oil, and phosphate lands, the President considers to have worked reasonably well. While in his judgment the doctrine of extralateral rights is vexatious and should not have been incorporated into the law, he feels that any change now would do more harm than good; a general though by no means universally held opinion among mining engineers, it may be remarked. So too, he suggests, while it might have been well in the beginning to have leased rather than sold all mineral lands, the time for such action has passed except as noted. For coal, oil and gas, and phosphate lands he considers special reasons to exist that warrant a change now to the leasing system. In brief these reasons are that a large part of the whole amount of coal and phosphate remaining unmined is on Government land and the same is thought to be true of oil and gas. In order to secure economical development, proper conservation, and to restrict monopoly, he believes that a closer control should be exercised over these lands and that the substitution of a leasing system for sale will permit fair solution of these problems. The difficulties involved are frankly met and the President suggests that while at first it would doubtless be necessary to give the executive rather wide discretion as to terms of leases, these terms should be made statutory as rapidly as possible. In general, control rather than revenue should be sought, though a royalty neither greatly over or under the rate imposed by private owners should be exacted. The rate should be readjusted at fixed periods, the terms of the leases should be long, the areas leased sufficiently large to warrent investment, the bids competitive, and, specifically in the case of gas and oil, exclusive prospecting permits for two years should be issued upon application and payment of a small sum. In the case of phosphate land, the Government should reserve the right to fix [illegible] Such in outline are the plans proposed by the President after hearing expressed [illegible] such evidently it will be his effort to have [illegible] into law. The changes proposed are sweeping and are radical when viewed in the light of the historic American policy of giving land freely to any one who will use it. The change is not however greater than was made in the various Australian States and the proposed system is one already in operation in many parts of the United States. Indeed if it be adopted the Federal Government will be but taking advantage of the experience of private land owners and of certain American States such as Minnesota and Colorado which now lease rather than sell mineral lands. The plan is not even as broad as that adopted by the States, since the latter lease metalliferous lands while Mr. Taft only proposes to apply the system to certain non-metalliferous minerals.

In regard to Alaska the President reiterates his recommendation of a commission form of government, pointing out that the population is not only scattered but migratory. He does not believe in extending financial assistance to secure building of railways, but is strongly of the opinion that the coal land laws should be modified so as to encourage the opening of mines. This, he believes, will be sufficient to induce the completion of projected lines and building of others. While strongly believing in the feasibility as well as necessity of controlling water-power development, he leaves to Congress without recommendation the question whether this should be done directly by the Federal Government or by the State acting as trustees.

All these recommendations are prefaced by a full and candid consideration of the arguments for and against each, and his conclusions are backed by detailed statements as to existing conditions. It is evident that Mr. Taft values special knowledge. He recommends the creation of a number of expert commissions and quotes freely from those who have made particular studies of individual problems. Mr. A. H. Brooks is quoted as to Alaska, Mr. C. W. Hayes as to Panama, and Mr. G. O. Smith as to several things. As would be expected from his past service as Secretary of War, Mr. Taft places a high estimate on the opinions of the Army engineers. We are sorry to see that his references to reclamation do not do justice to the able engineers in the Reclamation Service. Throughout, the message is conservative. He evidently holds strongly to the opinion that the country has reached a stage where additional changes in the law should only be made with great caution. The keynote of his message is the closing sentence: "It is in the interest of all the people of the country that for the time being the activities of the Government, in addition to enforcing earnestly and impartially the existing laws, should be directed to economy of administration, to enlargement of opportunities for foreign trade, to the conservation and improvement of our agricultural lands and our other natural resources, to the building up of home industries, and to the strengthening of confidence of capital in domestic investment."

Visiting the Gold Coast, West Africa

By F. F. Sharpless

The article in the *Mining and Scientific Press* of September 10, by J. A. MacDonald, and his comments on the viewpoint of a traveler in a rough country are entertaining and call to mind a recent experience on the West Coast of Africa.

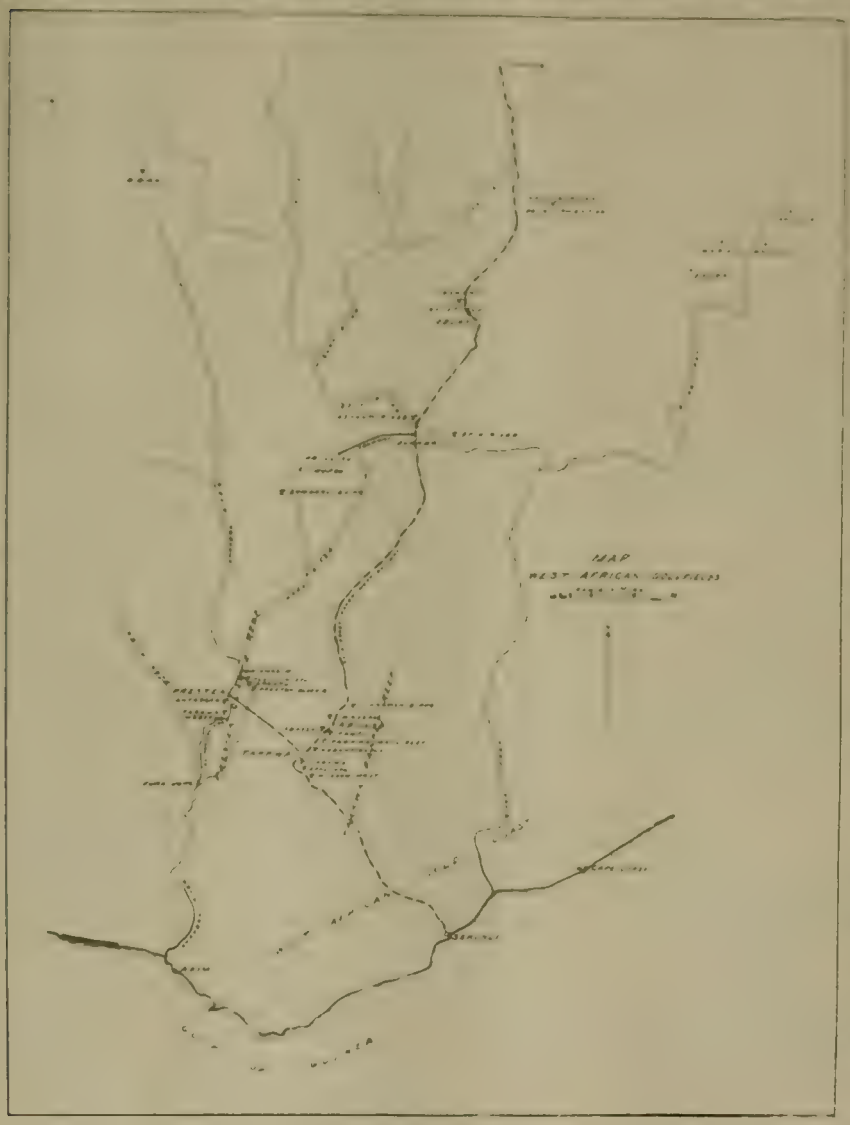
"No, thank you, none of the West Coast for me," would be the answer given by a large majority of Americans if asked to go to that country. Ever since gold in the West Coast has been sought, stories of an impossible climate, a country pregnant with disease and hardship, a country to which many white men went, but from which few returned, have been common. It is a bad country. Many of the stories are true and give a bad impression, but mainly because they do not tell all of the truth. I confess that it was with some misgivings that I took steamer for the Gold Coast, in January 1910. The anticipation of sickness in a foreign and little known country added no grain of comfort to a rough passage in a small steamer across the Bay of Biscay, and at that time I had little thought that I would some day look back upon the trip as one full of interest from start to finish—one full of interesting and pleasant experiences, and almost as free from disagreeable incidents as though the trip had been made in one of the more sparsely settled districts of our own continent. The steamers from Liverpool to the West Coast are small, slow boats, and as there is but little competition for the passenger traffic, accommodations are not of trans-Atlantic steamer quality. They, however, compare favorably with those between North and South American ports. It is on the steamer that the traveler's interest is first aroused in this part of the 'Dark Continent.' He is thrown into intimate contact with men who have lived for years in the country. Some are inclined to paint the horrors of the jungle in somber color for the benefit of the tenderfoot, especially if he is inclined to show the white feather, and many a poor chap has landed and started for the mines feeling sure he had seen the ocean for the last time. But it is also on the steamer that there is opportunity for talking with government officials who are spending the greater part of their lives on or near the coast. These men, as a class, are intelligent courteous fellows, ready to tell what they know of the people and the country in which they live, and many a pleasant hour may be spent listening to experiences of themselves and of others in this strange land. On the steamer one is able to learn in a short time, much respecting the native customs and habits, their beliefs, their superstitions, and their religions: if, indeed, they have anything that can be called religion. Then there are almost sure to be on board mining men who have been in the country before, and from them one may learn much of interest respecting the business that is calling him to the country. Short stops are made at the Canary Islands and at Sierra Leone, but the two weeks on the steamer slip away quickly and Sekondi is sighted before the voyage has become wearisome.

Sekondi, or Seccondee, is the port of entry for nearly all of the mines. The European portion is clean, and attempts to keep the native quarter in the same condition have been fairly successful, but the presence of many stagnant pools, lack of good fresh water, and the very nature of the black man are all against ultimate success or perfect healthfulness. Fever is always present and probably always will be, but it is not bad for a Coast town, as one learns if he has occasion to visit others where there are fewer white men. Sekondi boasts the one hotel that is to be found in the whole of the mining district, and after this is left behind the traveler must depend upon the courtesy of the white men he meets and upon his own servants. As a matter of fact, the first thing after landing is to look up a good cook and a black steward boy, indispensable accessories of an outfit if much of the country is to be seen. The steward boy acts as interpreter, is head boy among the carriers, looks after the traveler's personal wants, buys his railway tickets, attends to the baggage, the hammock, the bath, and stands at 'attention' for all odds and ends. On landing at Sekondi I was soon spotted by a black man who had an important matter on his mind. For some time I could not understand his language, but after a time it dawned upon me that he was talking English, and was informing me that he had been sent to act as my steward boy during my stay in the country. I feared for a while that I would have to employ an interpreter to tell me what my interpreter had to say, but by degrees I learned his English, and he learned mine, so that we got on fairly well. This boy followed me like a dog all over the country and did his best to take good care of me. A few nights after landing we were stopping with the manager of an English trading company. I had retired early and was awakened from a sound sleep about midnight by peculiar motions of my bed. Presently I thought I could hear some one breathing: reaching out, I turned on the electric light, but no one was in sight. Looking under the bed, I was astonished to see a big black thing coiled up there in the 'all together,' fast asleep. It was my steward boy. Asking him in the morning why he slept under my bed, he replied, "I no savey the black boys in zis Massa's bungalow. I look you well (I must take good care of you). I sleep your bed."

Leaving Sekondi by the early morning train, for which privilege one pays a very liberal retainer, our way led through a tropical jungle for some hours. There are a lot of native villages along the railway track, and a large percentage of slightly clad natives, children predominating, indolently watch the train go by. There are a few plantin farms on either side of the track and a little corn, but every day is Sunday with most of the natives, and little work supplies all their wants. So why should they work? About nine, I reached the town of Tarkwa, or Tarquah. Whe Weste Coast is a paradise for one weak in orthography. Spell any word the way it sounds to you, and no one can say you

are wrong. To be sure it is a little inconvenient sometimes your letter or telegram may be sent to the wrong town, but that is not very hard.

Tarkwa is the first large village reached on the railway. It is in the centre of the mining district and from it supplies are sent out over the entire field. At Tarkwa of last necessity to any particular mine you will probably be met by Mr. Auerbach or Mr. Abrahem, managers of the Tarkwa Trading Co., or



West Coast Goldfields.

by one of the clerks of this most hospitable establishment, and from this time forward you will have few troubles because of being a stranger in a strange land. Here you will receive suggestions and help in regard to outfitting both as to supplies and carriers. You meet the managers of the local mines, and you meet the government men, all of whom are courteous and kind, ready to give you whatever help or assistance you may require. So pleasant do they make it, that some of us found it hard to tear ourselves away for the rather more strenuous life of the bush. Tarkwa is directly over one of the bankets that is being successfully operated, and a few days spent underground at the nearby properties give one a fair idea of the characteristics of the formation at this particular point. However it will not do to draw the conclusion that all of the conglomerate has the same appearance and that assaying at Tarkwa the engineer will know it wherever he sees it. The area over which bankets or coarse sandstone or conglomerate occurs is large and many croppings are found, but even after a most intimate acquaintance with the Tarkwa banket no one can hazard a guess at its contents without panning or assaying. After a week or ten days at Tarkwa it is advisable to visit the Prestea formation for an equal time. Here the gold is found in quartz veins and these promise to be of equal commercial value with the banket deposits, indeed, it looks just at present as though they might, for a time, outstrip the latter in production. When the visitor has familiarized himself with conditions in these two districts he is ready to take to the bush and examine some of the prospects and less developed properties. Bush traveling is an experience worth having at least once, and if made in company with an experienced traveler, or if outfitted and properly started by some one who knows, there is much of pleasure and interest in such a trip. For two weeks or a month in the bush about twenty carriers will be found necessary. Of these eight should be good hammock boys, the rest may be boys or women, whichever are more convenient to secure. There are no beasts of burden in the country except the black people, because of the presence of the tsetse-fly, hence every traveler is accompanied by a small army of black followers. Of the outfit, a bunch of good hammock boys and a comfortable hammock are most essential. Walking is possible everywhere, and while the unencumbered traveler can easily outwalk his loaded carriers, he should not waste his strength unnecessarily. In addition to the hammock boys, there must be carriers for the 'chop' boxes, cooking outfit, clothing, bed, chair, table, bath, and any prospecting tools that may have to be carried. Chairs, tables, and baths may sound rather luxurious, but they are as much necessities as the chop box. The

daily bath, with plenty of fresh clothing, a comfortable steamer chair, a little camp table, and a well stocked chop box are not absolute necessities. You can get through the country without them, but don't try it. You have enough hardships, and these apparent luxuries mitigate the rougher experiences, giving one the impression that he is having a pleasure trip and make him fit for the real hardships when they do crop up. My first trip was taken along the railway. I wanted to get my outfit and myself broken in by a short trip. That was the first big blunder that I made; it was only a six-mile walk down the railway and then a mile into the bush, but the trip was started at 2 p.m. Hammock boys are of no use along the railway; they require a good foot-path, wide enough for two men to walk abreast, so that one end of the hammock may be carried between them. The consequence was, on this occasion, that I walked the six miles down the track in the broiling sun. The West Coast sun knows how to broil, and with the trees cut for 100 ft. on either side of the track, it gets splendid action on the man that ventures out in the sunshine at noon. It is the sun and alcohol to which may be attributed the long death roll on the Gold Coast. The amount of alcohol absorbed by many white men on the West Coast is large, so large that in any country the amount would be considered dangerous, but when here, loaded to the limit, a man goes out at mid-day and gets the full benefit of the sun on his head and spine, he has a strong hold on life if he lives long. The little six-mile trip taught me some lessons, and when I started out the next time, I saw to it that any tramping in the sunlight was done in the early morning, or late afternoon. Away from the railway one soon plunges into the forest, and it may be that for half an hour at a time he will scarcely see the sun; it is only as villages are approached and the plantations around them are entered, that one is forcibly reminded of the existence of the sun, and takes to his hammock regardless of the condition of the trail. Starting out in the early morning, the traveler generally walks for several miles, or for an hour or two. By that time he is ready for a dry shirt and a ride in the hammock. He continues in the latter most of the day except when the trail grows too narrow or too rough for easy carrying, when he takes to foot and gives his boys a rest. Villages along the trail are passed at frequent intervals, giving one the impression that the country is thickly populated, and that laborers are plentiful. But unfortunate is the traveler who has occasion to hire a few men along the way. He will find that "all of the workers are out on the farms," or "they are sick," or his "bundles are too big," or he is "going too far," or "there is nothing to eat" where he is going, or they "can't go until they have had chop."

One of the important 'don'ts' is, don't leave your base of supplies without taking all of the men you need and to spare. They are a happy lot of creatures, both your carriers and the people of the villages through which you pass. There is continuous chatter and laughter all day long among your followers, and nearly always a pleasant reception in every village passed. Stopping for lunch near a village, you generally find it ready to feed your boys for a small consideration, and to furnish you with eggs or chickens, if there are any. At night the custom is for the traveler to stop at one of the more prosperous villages. His steward goes to the head man, chief, or king, as he may be called, and asks for the best house in the place. A house is selected, the owners move out, it is swept out, and the traveler's outfit deposited. Many of the villages are clean, and I found this method of getting on much more satisfactory than carrying a tent. Chickens, eggs, and vegetables are nearly always to be found, and these are used so far as possible, sparing the chop box until a more unfortunate day. Your native provision is generally given or 'dashed' you, and by return 'dashes' of sugar, candles, or coffee, you pay a fairly good price for what you get. On the trail your water bottle is something to be remembered. Don't part with the water bottle and its boiled water on any pretext. This was forced home to me one day when I was walking for a little while. I was in a country where the trails were unknown to my porters. After an hour and a half walking I realized that we had lost the trail and were in for a long tramp to return by the way we had come, or a short and hard tramp through thick jungle to get back into the proper trail. We took the latter course, but didn't find the cut a short one. We were four hours getting back to our trail, four hours without water and with violent exercise, taught me to be careful about that water bottle on subsequent trips. Traveling at night is spooky work. At night the boys are quiet, and as the party tramps through the forest nothing is heard but the dull patter of the bare feet on the smooth trail. An occasional owl hoot is in harmony with the surroundings, and the maniac yell of the flying squirrel close at hand, starts a shiver as you wake from a doze in your hammock. The real work in traveling is off the beaten trails. When it is necessary to do any prospecting, or make examinations of old native works, trails must be cut for every foot of ground covered. You must be right up with, or ahead of the boys with the cutlasses, and you are working harder than they all of the time. Left to themselves the boys spend much time in resting, and have a way of making paths in most every direction except in that in which you wish to travel. Time is not an important factor with the native, and the foreigner does well to allow himself a large margin of safety when calculating the number of days he will devote to a given piece of work.

Leaving the country is always a pleasant and sometimes an interesting part of the trip. I had finished by last examination and had returned to the railway ready to take the train the following morning to my headquarters; the steamer was to leave a few days later. About 10 o'clock I was awakened from my first doze by the native station master who brought me a letter. I didn't care particularly for a letter then, but out of curiosity opened it, to learn that the port was closed because of yellow fever, and that no steamers would stop until further notice.

My dreams were not pleasant that night, indeed I do not remember that I had any dreams at all. I was quite fully occupied with wondering how I was going to get out of that country. My work was finished, my outfit disposed of, my boys scattered. There were other ports, but they were many days away and might be closed by the time I could re-equip and reach them. I was fortunate in finding near at hand a camp where I was hospitably taken in and allowed to loaf for a few days until the worst of the scare was over. In two weeks a village near Sekondi was officially declared clean, and steamers were permitted to take passengers from it. The night previous to the sailing day found several of us on hand with our baggage, which fortunately included bedding, and it was also fortunate that it was after dark when we reached the village, Chama by name, an old coast trading town. Had we been aware of all the dirt around us, and yellow fever known to be only six miles away, our slumbers might have been anything but restful. As it was we slept in comfort and in ignorance and at 10 next morning had the pleasure of seeing steamer smoke on the horizon. About the same time a party of Europeans, something more than a score, who had been in quarantine for two weeks at Sekondi, arrived. They were more anxious to leave the country than we, and immediately engaged all the surf boats in sight and started for the smoke. By the time the steamer had reached its anchorage two miles from the shore we were ready to go out, too. Our head boatman, however, informed us that the steamer just dropping its anchor was a freight boat and that ours might be the one that was just then showing smoke on the horizon. He further advised us to take our baggage out of the boat and put it under cover and not to go out for a while, as it looked like rain. We were wise enough to adopt the suggestion of the old boatman, and our baggage was just safely put away when a hurricane broke over us and for two hours lashed the shore with wind, rain, and waves, while we sat and wondered what the boys on the water were doing.

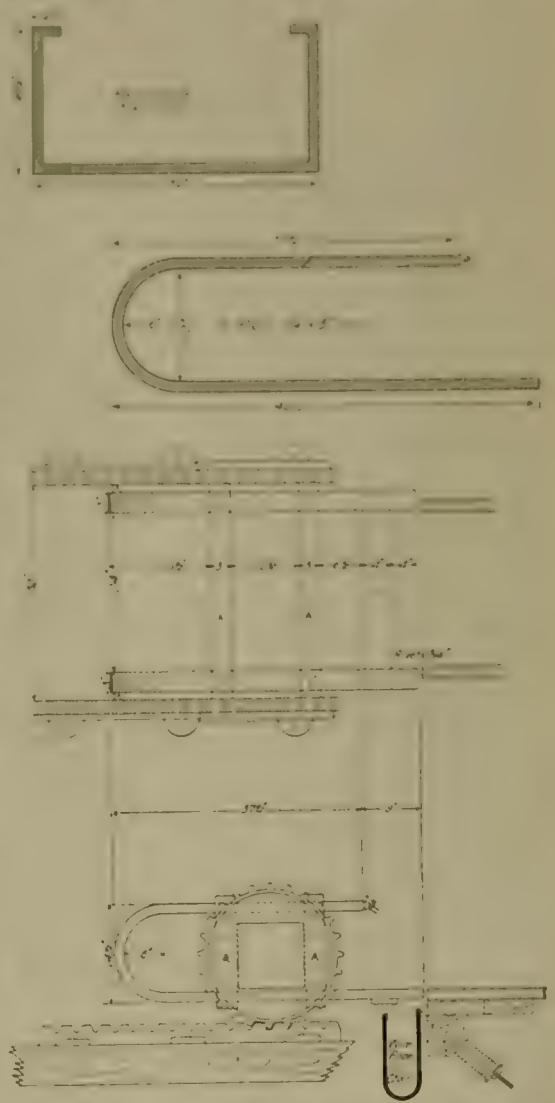
Our boatman finally came and advised us that it was safe to go out and that our steamer was now waiting us. It was rather a rough passage, but a pleasure trip in comparison with the experience of the first party. The white men in each of the canoes had been bailing with their helmets and hands; three of the canoes had turned over and emptied their contents into the sea. The men in them had been saved, but minus their belongings. Speaking with one of the unfortunates later he remarked, "Well, I had the time of my life, but I am glad it's over." Some of my readers may have an opportunity to go to the West Coast. My advice is, don't expect a pleasure trip, don't take your wife, and don't fail to go if you get a chance. It is fully worth the little inconveniences that you must suffer.

Nuggets of hornsilver were picked up on the slope of Antelope hill, southern Yavapai county, Arizona, in 1890, but no large deposit or vein of the mineral was found in the vicinity.

CRADLE FOR DUMPING MINE CARS

By S. A. Cisco

The accompanying sketches illustrate the type of cradle used by several companies in shaft work in Missouri. While many operators may be familiar with this type there will be others to whom it is new and some benefit may be derived from a description of it.



In the construction of the cradle, the gear-wheel and rack-rail are made of cast iron, the gear usually being chilled, while gray cast answers for the rail. Two rail frames A, of 3 by 1-in. iron, 52½ in. long, bent as shown, are riveted to the gear-wheel with eight ¾-in. rivets. The **U** rails consist of two pieces of 3 by 1¼-in. iron, 7 ft. 9¾ in. long. These are riveted inside of the rail-frame, the distance between the rails being the same as the gauge of the track. The measurements given are for a cradle handling a one-ton car with a 24-in. track gauge. The curve of the **U** rail is governed by the radius of the car-wheel. A stout spring fastened with an eyebolt to a timber and connected to the cradle by means of a chain or wire rope, will right the cradle after dumping the car.

Cyanidation of Cripple Creek Ores

By Philip Argall

*We are here tonight to help celebrate the successful starting of the second unit of Stratton's Independence mill. We thus reach an important point, not alone in the history of our own mine, but also in the history of the Cripple Creek district; the pioneer work is accomplished and wet-milling of $3 sulpho-telluride ores established as a profitable industry, away up here in the mountains where milling supplies are charged all the traffic will bear. Most of you have contributed, in one way or another, your knowledge, strength, and experience to help obtain this great result; though several of those who started out with us in the summer of 1907, in what was then called by hotel experts and club loungers 'the metallurgical impossibility,' have moved to other scenes and assumed new responsibilities while others again have but recently joined our ranks. To these younger men we look with expectant interest, for new ideas and for renewed energy which may lead to greater efficiency in all departments. At such a time as this one may be pardoned for pausing in retrospective mood to view again the point from which he journeyed and perhaps push the tentacles of thought out into the uncertain future, to see in vision, as it were, the ultimate metallurgical destiny of wet-milling the sulpho-telluride ores of Cripple Creek.

Eighteen years ago I first became interested in cyanidation and soon thereafter accepted the position of consulting engineer to the company holding the McArthur-Forrest patents for America. I made my initial trip to Deadwood, South Dakota, to examine into unexpected troubles that cropped up in the first cyanide mill built in the Black Hills, the ores of which were so favorable to cyanidation. The first mill erected was for a time a failure and but few, if any, foresaw the brilliant future for the cyanide process in that great mining district. My second trip was to Cripple Creek, where a small cyanide plant had been erected, later called the Brodie mill. This mill failed to give the results expected, as had also the one at Deadwood, and for precisely the same reason. The ore after grinding could not be leached. Improved crushing machinery, however, solved the problem in both cases, and the Brodie mill struggled along for some time at a capacity of 15 tons per day, later raised to 30 or 50, and ultimately, I believe, to 100 tons per day. In the spring of 1894 we had no difficulty in procuring a full supply of ore for the Brodie mill of about one ounce value per ton, for which the mill received $15 per ton treatment charge and needed every cent of it. My connection with this mill, though short, was ample to convince me that cyanidation had a great future in the metallurgy of Cripple Creek ores. I consequently experimented quite extensively with the telluride ores and, in fact, worked out, wrote up, and published the identical method of treatment now in use at Stratton's Independence mill. I proclaimed the cyanide process to be the most suitable all-round method for treating Cripple Creek ores, a thesis I stoutly maintained with tongue and pen against all comers, until the use of cyanide became universal in the milling of Cripple Creek ores.

The fall of 1904 found me engaged in building the first large custom mill for the direct cyanidation of telluride ores, while the following year I introduced roasting as an important step in cyaniding sulpho-tellurides. The Metallic works, also a pioneer in Cripple Creek metallurgy, ultimately reached a capacity of 10,000 tons per month, and at the close of my engagement, January 1901, had treated almost half a million tons of Cripple Creek ore, mostly by the roasting process, and had from the first earned good dividends on the investment, and this in the face of a steadily decreasing treatment charge.

From my first connection with Cripple Creek milling, to the close of 1900, the average treatment charge had been reduced 50 per cent, and it must be conceded that the works of the Metallic Extraction Co. was an important factor in this great reduction. Were I relating a personal narrative, or holding forth on my varied experience in cyanidation, I would next direct your attention to Mexico, to Canada, and to other countries. I am, however, merely tracing the progress in cyaniding Cripple Creek ores and incidentally, though briefly, noting my own pioneer work in that connection. Suffice it to say, then, I returned to this field of activity in 1906 and early the following year took up the greatest ore-treatment problem of my life. To understand it clearly, it might be permissible to say that at the Metallic Extraction Co.'s works near Florence, where fuel and general supplies were reasonable, the climate mild, and water abundant, I had gotten the ore treatment cost down to what I then considered a low figure. The problem involved in Stratton's Independence dump, however, contemplated the profitable treatment of an ore—including mining it in the dump and conveying it to the mill—the total value of which was less than our average cost for treating a ton of ore in the Metallic works in the year of grace 1900. Here, then, was a problem of some magnitude and I will frankly admit that it was only the quantity available in the dump, something like a million tons, that induced me to make the attempt. Roasting was out of the question on account of the cost; so I went back to my old concentration tests of 1894, and found that modern concentrators and fine grinding gave very encouraging results. A long series of experiments proved to my satisfaction that 35% of the gold value could be removed as concentrate from average dump ore, and, strange to say, cyanide was good for a similar percentage. Next came the cost of the method, to determine which I had to draw on previous experience in concentrating and cyaniding on a large scale. Finally, having proved my experimental work in all particulars, I cabled the company in March 1907, that a mill of 10,000 tons monthly capacity could

*Address at banquet in celebration of the first month's run of the second unit of the new Stratton's Independence mill.

treat the tramp ore by the proposed method at a cost of $1.00 per ton, obtaining a recovery of 70% of the contained gold. These figures, as you know, have been exceeded by actual working results, and still greater extraction is expected to be attained. But both the present cost of power and supplies is scarcely justified from a commercial point of view.

The method used in our mill we have termed cyanidation, a process as yet a combination of well-known devices and chemicals to obtain the desired end. We have no secrets chemical or otherwise, and from the first day the plant has been open to the inspection of metallurgists and all information or data asked for by responsible parties has been freely supplied. The grade from a $10 per ton milling cost in 1894 to a cost of $1.00 per ton in 1910 is a great one. Still I believe the milling of low-grade sulphotelluride ore is today in its infancy. Improvements in machinery and methods will come, tending toward higher efficiency, better extraction and lower working cost. For the straight wet crushing of sulphotelluride ores a $1.25 working cost is now in sight on a basis of treating 10,000 tons per month, while the dollar milling cost is perhaps not far distant, and could possibly be attained in a well designed plant treating not less than 15,000 tons per month. In neither estimate, however, is amortization taken into account; the figures cover only the bare milling and maintenance cost.

Stratton's Independence mill, delayed for a time through financial reasons, started in April 1909, with a nominal capacity of 4500 tons per month, enlarged in December of that year to 7000 tons, and with the addition of the complete second unit last month, reached a capacity of 9000 tons. The mill, through the energy and ability of the staff, was profitably operated from the start, and is now earning 10% per annum on the capital of the company, and has treated to date 120,000 tons of dump rock; sufficient, I believe, to take it out of the class of 'metallurgical impossibilities,' if not to establish it as one of the chief industries of the Cripple Creek district. We all, more or less, realize what the local milling of the low-grade ores means to Cripple Creek. It does not offer a large or immediate reward to the mine-owner, but on the contrary calls for a considerable expenditure of capital; hence the development of the milling of low-grade ore must proceed conservatively along the lines of consolidation of small properties or joint milling on a co-operative basis. Milling the low-grade ores in the district does, however, mean the maintaining of, and possibly an increase in, the output of shipping ore; the prolongation of the life of the camp, I might say, indefinitely; the steady employment of large numbers of men in the mines and mills and the purchase of vast quantities of supplies. In a word, high-grade production tends to make millionaires, the low grade, a populous, prosperous, and permanent community. The Cripple Creek district will, I hope, continue to give us an occasional millionaire and an ever-increasing community of active and prosperous workers.

I believe, gentlemen, you will ever find cause for congratulation in the fact that you were pioneers in this low-grade milling industry. Your work has shown that sulphotelluride ores can be treated at a profit, and I sincerely thank you for your co-operation and assistance in this great work, second to nothing that has ever been undertaken in the Cripple Creek district, which you paved the way others can safely follow, successive steps and, let us hope, in time improve. Nevertheless, I would not have you forget that great as has been our responsibility and arduous the work, yet I believe the ultimate credit is due to the directors of Stratton's Independence, Limited, who eight years ago realizing that one fifth of the production of their mine was finding its way into the ore house dump, started research work looking toward its recovery, first, by electrocyanide methods, later by erecting and operating an experimental plant at a cost of nearly $60,000, and experimenting in various ways for fully four years, lastly, sanctioning the expenditure of more than a quarter of a million dollars in the plant we erected and are now operating. At all times I felt I had in our board real men behind me, gentlemen who supported and encouraged me at every step and who never lost confidence in the ultimate outcome of the undertaking. To these gentlemen is due, then, the full credit for introducing low-grade milling into the Cripple Creek district, and it is through their keen business acumen that success has been achieved and that we are here tonight to celebrate it, even at a time when others continue to use their low-grade ore to ballast railways and fill waste places along the right of way. Much has been said and written of late about the great and little-understood doctrine of conservation, but here is true conservation, the creation of a great and profitable industry from the waste rock of yesterday. A new era is dawning over the Cripple Creek district, local milling is firmly established by two great mills, the largest ever erected in the district. This, however, is but the beginning of home treatment, which, I believe, will rapidly expand in the near future and very soon cover the entire field. Cyanogen is king.

A down-draft furnace was invented about 1904 by the late Horace F. Brown, inventor of the Brown mechanical reverberatory furnace. Mr. Brown's idea was to introduce the ore at the top of the furnace in comminuted condition, the intense heat causing the ore to be reduced to a molten or semi-molten state before reaching the bottom of the furnace. The principal application of this departure from the time-honored practice that the inventor had in mind was the reduction of iron ores, particularly those of the Mesabi range of Minnesota, where the ore contains a large percentage of fine. Several trials of the down-draft furnace at Pittsburg, Pa., resulted successfully, but Mr. Brown died before having fully worked out his ideas to completion. He also calculated to apply the furnace to the reduction of auriferous and argentiferous ores of the West, and had he lived would probably have made a success of his furnace.

Designing a Thousand-Ton Concentrating Plant

By Charles C. Christensen

In the following pages is illustrated the method of planning a modern concentrating mill. The one described represents, in all its details, the most recent practice in fine-ore concentration, for treating a chalcopyrite ore. In designing it, the assumption has been made that electric current can be bought, transformed to the proper voltage, and distributed to the different motors in the mill. These are arranged so as to give unit drives to the several sections of the plant. The concentrator proper is planned to be divided into five sections, each of 200 tons capacity per 24 hr., with a separate crushing plant of double the capacity required, so as to run in the daytime only. In this crushing plant would be put one crusher, such as a No. 7½ Gates, set to crush to 3½ in., screening out approximately 25 tons per hour of 1-in. material. The rejected matter would be sent to two No. 5 crushers set to crush to 2 in. From the two machines it would be expected to screen out about 30 tons per hour of 1-in. material. This would leave 45 tons to be distributed among three No. 3 Gates crushers set to about 1½-in., screening out about 25 tons of 1-in. material, returning the remainder to the same machines for re-crushing. Thus in 10 hours 1000 tons of 1-in. material would be made ready for the concentrating plant. The ore as it is taken from the mine in cars should be discharged into a large steel ore-bin above the largest crushers, and the crushed ore transferred to the concentrating plant by belt-conveyors discharging by an automatic tripper, into the ore-bins, behind the crushing rolls.

The five sections of the concentrating plant are designed alike and but one will be described. The crushed ore is to be drawn from the bin by a Gates, type 'H' wall-feeder, and discharged into the first set of 36 by 10-in. crushing rolls, which should be set approximately at ½ in. At this point, water could be added if found desirable, and the crushed material would fall with the water into the boot of a 10-in. vertical bucket-elevator, which would deliver the crushed ore into the only sizing-screen required. This trommel would make a division at, let it be assumed, ⅜ in., which size could be altered at any time by either a coarser or finer screen as found desirable. The material coarser than ⅜ in. would fall by gravity into the second set of 36 by 10-in. rolls, set at ¼ in. This crushed material would have to be re-elevated and re-screened. The material finer than ⅜ in. would pass at the end of the trommel into a 20-in. Richards annular vortex classifier, designed for use in connection with Hancock jigs. The object of this classifier is to make an unsized spigot-product ranging from the coarser size, according to the perforations of the screen, down to as fine as the jig can conveniently handle while making clean concentrate. The usual range on a ⅜-in. material is down to approximately 20-mesh, treated satisfactorily on one machine. The classifier can be regulated to a nicety, and the entire scheme of classification is founded on the water being at a constant and known head. The overflow of this classifier consists of the slime resulting from the first crushing. The type of jig selected is the Hancock, and was invented by H. R. Hancock when general manager of the Moonta mines in South Australia. Up to the time of its invention the mines in that district were not profitably treating the low-grade chalcopyrite and bornite ores. By means of the Hancock jig success was made. This jig consists of a box made of 4-in. lumber properly tied with angle-irons and rods. The box is approximately 25 ft. long by 4½ wide by 5 ft. 9 in. high. It is supported upon a cast-iron frame, the operating mechanism being beneath the body of the jig. This makes the total height of the machine nearly 10 ft. It is customary, however, to put the foundation of the jig underneath the operating-floor of the mill to bring the bottom of the box about at a level with the floor. In this box and submerged in the water, is the screen of the jig. This screen is 20 ft. long by 2 ft. 8 in. wide, and is divided into a series of pockets extending across the screen. These pockets hold a ragging or bed through which the concentrate works downward into the hutch. The screen or sieve is carried on two cast-steel cross-bars securely fastened to the screen. The cross-bars are supported by four upright arms, two on each side and outside the box. These arms or rods are connected at the bottom to rocking arm-shafts which are connected to levers the ends of which engage a three-way cam on the main drive shaft of the jig. This main drive shaft revolves at 60 to 65 r.p.m. and the result of this motion is a reciprocatory movement imparted to the sieve which can be described as an upward and forward, and downward and backward movement, so adjusted that it can be regulated to suit different kinds of ore. The number of reciprocations of the screen is 180 to 195 per minute. The Hancock jig will make clean concentrate in the first, second, and third hutches. The remainder of the jig can be devoted to making middling sufficiently rich to pay for re-grinding, and to making tailing which it would not pay to re-treat. The use of this jig simplifies the construction, decreases the size, and avoids many usual complications in laying out a concentrating-mill. The Hancock jig will do away with all trommels, except an oversize screen, and will simplify the arrangement of launders and transmission of power. All concentrate is deposited in the hutch, although it can be arranged to take off a clean concentrate from the top of the screen, if it is necessary. In operation, the fine material in the feed passes down through the screen into the hutch at once. The first screen has the finest mesh and is over the first compartment. The coarser part of the feed here forms a bed for the fine concentrate. The next hutch compartment receives the medium-sized concentrate, and the third hutch compartment the coarse concentrate. In the last part of the jig, commencing where the coarse concentrate comes down, the screen consists of plates punched ⅛ in.

latter than the largest size material the jig is handling. In this section of the jig no artificial bed of round ore pebbles, hematite or other heavy material of a certain size is used. At this point the jig is a classifier as well as a concentrating machine. Each hutch is provided with an independent water supply so that its action can be regulated as to the kind of material taken down into the hutch and also as to the cleanness of the concentrate. This latter applies only to the coarse concentrate compartment. The close bed over the fine concentrate compartment prevents any sand from going down into it. In the first section of the jig the hydraulic classification action carries along the fine sand while the coarse concentrate is passing down into the hutch. This is an important feature

Hancock Jigs in the Mill of the Federal Lead Company.

of the jig. The last two hutches are usually used for middling, as practically all the free mineral content of the feed is stratified and taken down into the hutch in the first three compartments. The dimensions of the hutch compartments can be changed in order to suit different requirements by moving the cleats which hold the hutch divisions. This jig will handle 100 tons per day as well as 500, and it is therefore just as well suited to a small concentrating plant of 100 tons in 24 hr. as to a larger mill.

The middling of the jig would fall by gravity and water into a standard 6-ft. Chilean mill for regrinding. This mill may be described as a circular trough or dish in which the crushing is done. The trough carries a rolled-steel ring-die about 5½ in. thick, upon which three rollers travel. An iron 'spider' is carried upon the central vertical shaft, and upon this spider are the [illegible] for the shafts of the three massive pressing rollers. The rollers are each of a solid disc of cast iron, shod with a rolled steel tire 4 in. thick, held in place by wedge bolts and having a heavy shaft driven tightly into a tapered hole in its centre to form its axis. These roller shafts have three collars of large section integral with themselves which prevent excessive lateral wear. The journal boxes carrying these shafts are adjustably secured to the spider by means of trunnions placed horizontally and at right angles to the wheel shafts. This provides flexibility of the rollers and renders them entirely independent of each other in passing over obstructions on the die. It also provides against excessive strain in the driving spider, which would be occasioned by uneven material upon the ring-die. Centrally situated upon the spider is the circular feed-trough, provided with three discharge-pipes, which guide the material being fed to a point upon the ring-die immediately in front of the approaching roller. Just back of each roller is a moving wing or mould-board which deflects the water, with the sand in suspension, upon the screen. The action of the rollers also materially assists in the work of screening. The inclined outside rim on the main trough or dish, is provided with six large openings to which are secured screen-frames carrying wire cloth, or perforated metal, affording a large screen area, of such a mesh as to release all mineral value without excessive sliming. Usually the screens vary from 12 or 16 to 20 mesh, depending upon the deposition of the mineral. The pulp from this Chilean mill would be elevated by a bucket-elevator, and would join the original slime

from the overflow of the annular classifier, for slime treatment. This combined slime-pulp would pass by gravity with water into a combined spitzkasten and vortex classifier. This classifier is a recent development and, being a combination of two well-known devices, provides a close sizing of the particles with the least possible hydraulic water. This classifier would be provided with three spigots, which would make three sizes, to be treated on four concentrating tables. The overflow of this classifier, consisting of the finest slime, would then be dewatered and the pulp thickened in two 8 ft. diam. by 8 ft. deep callow tanks, with siphon feeds, and this pulp would be distributed to four 6-ft. suspended vanners, equipped with corrugated belts. In practice it has been found that by dewatering fine pulp without loss, and by using corrugated belts, the tailing of vanners on the finest material is reduced to a minimum of value. Above the crushing rolls should be a 3-ton trolley running on suspended track with a 2-ton chain-block for roll repairs, and above the line of Chilean mills a 6-ton trolley and 3-ton chain-block to handle the Chilean-mill repairs. Steel buildings on stone or concrete foundations should be used to house the machinery, wherever possible.

Lead has recently risen in price $2 per cwt., or to a 4½c. basis. Lead production in 1909 was 922,206,000 lb. and in 1908, 827,736,000, both of these totals including lead smelted in bond. Daniel Guggenheim is quoted as saying that the American Smelters Securities Co. is now producing at the rate of 152,000,000 lb. per annum and A. S. & R. Co. 477,300,000, so that the total output of both concerns this year is expected to approximate 630,000,000. Production of lead by these two companies is partly from owned and controlled mines, but more largely from custom ores, bought in the open market or on time contracts, on the basis of market prices for metal contents at the time of purchase. Estimating one-quarter of the ore treated as being 'in process,' the rise in lead, if the advance be sustained, means additional profits to the two companies of between $150,000 and $160,000. Trade authorities look upon a rise of a cent a pound as unlikely, at least in the immediate future. General opinion is that supply is equal to demand.

The mine-rescue cars of the U. S. Bureau of Mines have all been outfitted and sent to their stations. The assignments are as follows:

Car No.	Headquarters.	Engineer in charge.
1	Wilkesbarre, Pa.	C. Enzian.
2	Trinidad, Colo.	J. C. Roberts.
3	Evansville, Ind.	R. Y. Williams.
4	Rock Springs, Wyo.	S. S. Smith.
5	Billings, Mont.	H. M. Wolflin.
6	Huntington, W. Va.	J. J. Rutledge.
7	Pittsburg, Pa.	J. W. Paul.

In addition stations are maintained at Pittsburg, Pa., Urbana, Ill., Knoxville, Tenn., McAlester, Okla., Seattle, Wash., and Birmingham, Alabama.

Tin mill-screens made of a good quality of Russia iron are often preferred by mill foremen, as they are inexpensive and last very well.

Nome Placer Mining

By T. M. Gibson

*The Pioneer Mining Co. has had its usual successful season. Its spring clean-up was approximately $700,000, and the summer sluicing season will add about $360,000 to this sum. The company had such rich ground in the Moonlight creek area that its workmen could not withstand the temptation to steal. Two suspects were followed to Seattle and arrested when in the act of selling gold-dust. They were made to disgorge $14,000 worth and are now being held for trial. Investigation developed the fact that several men were in the ring and about $6000 worth of gold was recovered from hiding places about Nome. The thieves were all Mr. Lindeberg's countrymen, and he is inclined to be lenient with them. Jafet Lindeberg, the president of the company, says it will declare a 14% dividend this fall, amounting to $700,000. The company now has $1,500,000 in the treasury. The splendid ditch system of the Miocene Ditch Co. was acquired last spring, after extended negotiations, together with all property held by that company. The Miocene Ditch Co. was capitalized at $1,000,000 and the Pioneer company already owned $186,000 worth of its stock. The deal taking over the balance was based on 50c. per share, or $500,000 for the whole property. The Pioneer company agrees to pay to the stockholders of the Miocene company 20% of the gross output from its operations until the full purchase price has been paid. The Pioneer company has used the water from this ditch system to excellent advantage during the past season. A hydraulic elevator on Glacier creek has been run and $80,000 mined at this point. Another hydraulic elevator was used on the McKay bench near Moonlight Springs, where $90,000 was mined, and it is estimated that $20,000 was left in the last pit because the sudden freeze October 1 prevented cleaning the bedrock. Another elevator on Bench claim No. 2 Below Specimen has $30,000 to its credit, and $140,000 was taken from open-cut work in the Moonlight area. On No. 1 Specimen, direct hydraulic operations were conducted, using a giant to stack tailing. This claim has $20,000 to its credit. The Pioneer company will not do any drift mining this winter, but will do considerable work improving the Miocene ditch. A cut-off through the Clara Creek divide will be made, and this together with a syphon line across the Clara valley will cut out about two miles of ditch in a section where the loss by leakage is heavy. The cut-off will be 1800 ft. long, 600 ft. on each end being open-cut, with 600 ft. of tunnel between. The open-cut work has already been completed. The tunnel will be 12 ft. on the bottom, 10 ft. at the top, and 5½ ft. high in the clear. Another tunnel 900 ft. long, of the same dimensions, will be driven through a rocky point near Hobson creek known as Cape Horn. The present tunnel from Glacier creek to Anvil creek, which is about 1000 ft. long, will be enlarged to the same size as the other.

*A separate account of dredging operations at Nome in 1910 will be presented in the *Mining and Scientific Press* January 7.

All this rock work will be done by hand. It is the intention of the company to enlarge the Monroe ditch to a capacity of 5000 miners inches. A steam shovel has been working at this for the last two years. Next year four more shovels will be shipped in, and it is expected the work will be finished by the first of next October. The following season the shovels will be used on the Pioneer ditch, and its capacity will be increased to 5000 inches. Mr. Lindeberg is planning extensive ground-sluicing in the vicinity of Moonlight and Little creeks. He estimates the company's holdings in that area to contain $14,000,000. He says it has 100 acres that will yield $100,000 per acre, and another 100 acres that will yield $40,000 per acre. This area is from 20 to 40 ft. deep, and he will ground-sluice 10 to 15 ft. of the surface tundra and drain through the big open ditch leading down Little creek. He believes the warm air of the summer will soon thaw the gravel which lies underneath. He contemplates the use of mechanical elevators to handle this gravel, and expects to handle the entire area at a cost of between 30 and 40c. per cu. yd. He may be overestimating the gross yield, but this area is conceded to be very rich. He expects to keep his surface ground-sluicing at least two years ahead of his mining. Mr. Lindeberg was fortunate in his trials, last July and August, on the charges of perjury in connection with litigation over the Bear Cub mining claim, in which the Pioneer company has an interest. James Murray and Barney O'Reilly re-located the claim January 1, 1909, alleging that the annual labor required by law had not been performed for the year 1908. The Pioneer company set up the claim that the work had been performed by lessees sluicing old tailing on the Bear Cub claim, and also by a man who was specifically employed to do the work, and they brought an action against Murray and O'Reilly to regain possession. In the course of this suit Murray and O'Reilly subpoenaed Mr. Lindeberg to take his deposition. This deposition was taken before Mrs. Cordelia Noble, a notary public. Mr. Lindeberg in the same suit made an affidavit before Lawrence Kerr, a notary public, in which he made some of the same statements as were made in the deposition. Murray and O'Reilly alleged that certain of these statements were wilfully and knowingly false and therefore constituted perjury. The matter was brought to the attention of the Grand Jury and they returned indictments against Mr. Lindeberg on three counts, two in connection with the deposition, and one as to the affidavit. He alleged that George Grigsby, United States District Attorney, who was one of the attorneys for Murray and O'Reilly, had procured the indictments in order to aid him in the civil action over the Bear Cub claim, and much pressure was brought to bear on the administration to cause his removal from office before the cases came to trial. These efforts were successful, Mr. Grigsby being removed just one week before the cases were set for trial. Mr. Lindeberg went into the trial with two lawyers from San Francisco and five of the leading attorneys of Nome representing him. In the matter of the indictment under the deposition, his attorneys took the position that inasmuch as there has been no enabling act passed by Congress for the District of Alaska, a woman cannot legally administer an oath and that false statements made before a woman notary did not constitute perjury. After several days of argument and the reading of much law the Court decided that their point was well taken and dismissed the indictments. Some days later the trial on the indictment under the affidavit came up for hearing. Much to the astonishment of the District Attorney's office the affidavit upon which the indictment was based could not be found although it was supposed to be securely locked in the office safe. Search where they would the paper had disappeared. A subpoena was issued for Lawrence Kerr, and it was found that he was on the high seas, having taken a boat for Seattle just before the case came on for trial. The District Attorney had him subpoenaed by telegraph to Seattle, but he refused to return. The last indictment was then dismissed on motion of Lindeberg's attorneys on the ground that no evidence had been produced tending to show the guilt of the defendant.

A matter for congratulation among all miners using steam-power in the vicinity of Nome is the fact that the Associated Oil Co. has established a branch of its business here during the past summer. It has erected for storing crude oil a steel tank 90 ft. in diameter and 30 ft. high. It will hold approximately 1,500,000 gallons. The oil-ship *Porter* in October discharged a cargo of oil into the tank, and the company is now ready to do business. It is announced that the company will reduce the price of oil to $2 per barrel, as against $3 that has been charged by the John J. Sesnon company during recent years. The reduction of the price of oil 33⅓% will undoubtedly be the means of encouraging the miners to renewed efforts.

A new find which may prove to be of considerable importance to Nome has been made this summer by T. M. Gibson and Pete Cavanaugh, operating No. 9 Dexter creek under lease from Leo Loewenherz. A body of pay-gravel has been opened on the left limit near the creek, lying more than 30 ft. below the bedrock in the creek. It appears to be an older and deeper valley than the present valley of Dexter. The bedrock in the creek is a calcareous schist, and as No. 9 was a rich claim, it has been worked from end to end and from one to five feet of bedrock taken up to recover the gold that had worked down into the crevices. The new find shows a low rim separating it from the present creek, and then it drops off abruptly to a depth of 30 ft. and no bedrock yet in sight. Several thousand dollars were extracted before the close of the sluicing season. The lessees installed a mechanical elevator consisting of a steel lattice-work ladder 52 ft. long, and a line of buckets bolted to double sprocket-chains, and revolving on sprocket-wheels at each end of the ladder. There are 85 buckets having a capacity of one-half cubic foot each, and these are delivered at the rate of 65 buckets per minute. The material is dumped into a chute from which it slides into a line of sluices. A 12-hp. Union gas engine supplies the power. The ground has been opened by a hopper-shaped pit or

glory-hole, which is continually widened and deepened. The material is loose and breaks down freely. Each man working on the slopes with a pick and shovel will break loose 40 cu. yd. in a ten-hour shift. This material slides to the bottom and is picked up by the bucket line and delivered to the sluices. When the slope becomes too flat for free delivery to the bottom, the hole is deepened five or six feet, and the ladder made to stand at a higher angle, when the walls may again be attacked from the bottom upward. So far very little water has been encountered. The work has not yet been carried far enough to determine the true character of the deposit, but it is believed to be an old channel which became filled by a slide of the soft schist along the north slope of the valley at this point, crowding the creek over to the south. There it cut a channel into the bedrock of what was formerly the south slope of the valley, thus making a low bedrock rim between its present bed and the deeper channel. The deposit shows in the pit kidneys and pockets of well-washed gravel, ranging from less than a cubic yard to forty or more yards in a pocket, the whole being embedded in reddish colored and much decomposed schist. The wall of the pit on the north side, next to the hill, now has a vertical elevation of 55 ft., and this shows three well-defined faults or slip seams along an exposed face of 150 ft. A sticky gouge has developed along these seams, showing them to have been lines of movement, and this is also proved by nonconformity of the stratification. Dexter creek was one of the bonanza finds in the early history of Nome, and it is confidently believed that if this new find covers an extensive area, it will influence the output of the district in the immediate future. Shafts are now being sunk to ascertain the extent of the deposit.

CALCULATING VALUE IN PLACER GROUND

By O. H. Packer

The casing ordinarily used with a power percussion-drill in testing placer ground is 5⅞ in. inside and 6½ in. outside and is called 6-in. casing. The outside diameter of the drive-shoe is 7½ in. The actual amount of the ground delivered to the panner depends chiefly upon two things: the nature of the ground and the method of drilling. To some extent the form and condition of the shoe affect results. For these reasons engineers have not adopted a uniform 'pipe factor.' Laying all arguments aside, the proper 'pipe factor' to use is the one that will give results in accordance with tests made by sinking a shaft by hand. In a large majority of cases, judging by past experience, it may be assumed that 100 ft. of hole with a 7½-in. shoe will represent 1 cu. yd. of ground. Upon this basis I have constructed the chart accompanying this to facilitate valuation calculations.

The method of panning and drilling deserves attention in this connection. I do not approve of the method of counting the 'colors' obtained by the panner. Neither do I approve of the method of panning a portion of the ground delivered by the pump. I always run through a rocker all the material obtained from a hole and then pan the concentrate, using mercury when the colors are small. The samples are kept in small numbered vials. The mercury is dissolved with nitric acid and the resulting gold weighed in milligrams. If the colors are large the sample is inquartated with silver and parted with nitric acid. In either case pure gold is obtained. If the fineness of the gold is not considered, gross error is likely to result. By weighing the pure gold, all chance of error is eliminated. If these precautions are taken, and the depth of hole kept at the proper point with reference to the bottom of the shoe, the use of my chart will give values concordant with results obtained by hand shaft sinking.

To obtain the value of the ground in cents per cubic yard by ordinary methods the pure gold being weighed in milligrams, a lengthy calculation is necessary. To avoid this calculation I have devised the chart referred to. In using the chart, begin with the weight of the pure gold in milligrams. Follow the horizontal line to the right to its intersection with the diagonal line representing the length of hole from which the gold was obtained. Follow down the vertical line to the bottom where the value of the ground in decimals of a dollar will be found. Following are a few examples:

Example 1. What is the value of dredging ground per cubic yard when 5.4 mg. of 20-carat gold is obtained from a 4-ft. hole?

Solution by ordinary method: 5.4 mg. $\times$ $^{20}/_{24}$ = 4.5 mg. of pure gold. $4.5 \times 0.0006646 = \$0.00299$ value of the gold, from 4 ft. of hole = $^{4}/_{100}$ cu. yd. $0.00299 \times 25 = \$0.0747$ per cubic yard.

Solution by the chart: Begin at 4.5 mg. (mg. of pure gold) in the left-hand column. Follow the horizontal line to the right to its intersection with the 4-ft. diagonal line. Drop to the bottom of the chart (at z) where the result $0.0747 per cu. yd. is found. If the weight of pure gold had been 45 mg. instead of 4.5 mg. the result is multiplied by 10, giving $0.747 per cubic yard.

Example 2. What is the value of dredging ground per cubic yard where 22 mg. of pure gold is obtained from 17 ft. of hole?

Solution: In this case the intersection is in the closely crowded lines. Take some multiple of 22, as $4 \times 22 = 88$. Follow the 88 line to intersection with the 17-ft. diagonal, and drop to the bottom, where 0.0344 will be found. Now divide by 4 and multiply by 10. The result is $0.086 per cu. yd. In many such cases the length of hole can be *divided* and the result *divided* by the same number.

Example 3. What is the value of the bedrock stratum of dredging ground 2½ ft. thick (last 2½ ft. of drill-hole) where 108 mg. of gold is obtained, 22 carats fine?

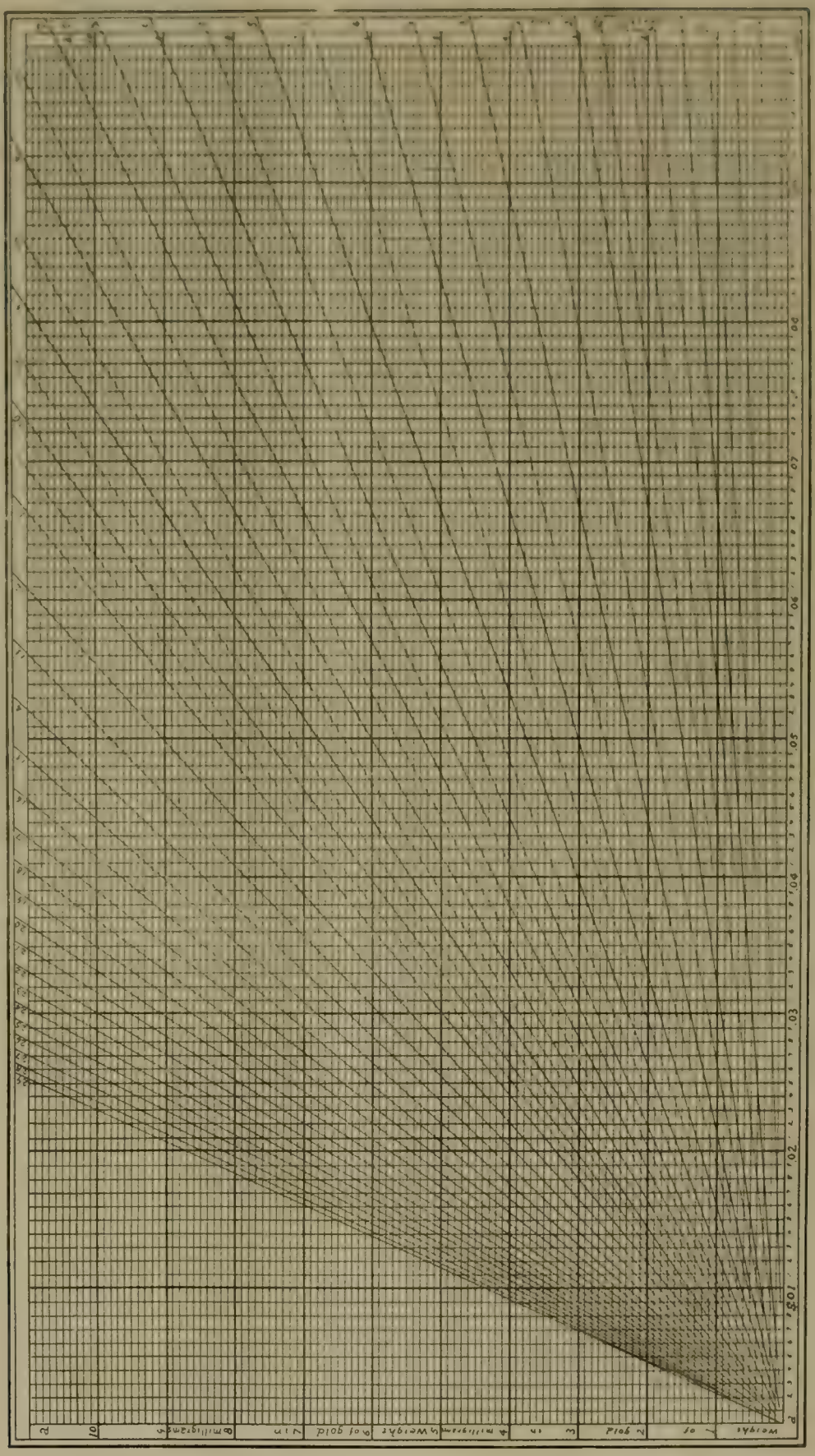
Solution: $108 \times$ $^{22}/_{24}$ = 99 mg. of pure gold. As the 9.9 mg. line does not cross the 2½-ft. diagonal, take $4 \times 2.5 = 10$. From the 10-ft. diagonal drop to the bottom at 0.0658, which multiplied by 10 for 99 mg. and by 4 for 2½-ft. hole, yields $2.632 per cubic yard.

If it is desired to compute values mathematically, the chart may be used to check the computations.

PROSPECTORS' CHART

For valuing placer ground after a percussion drill, 6 in. casing, 24 in. shoe, 100 ft. hole, 1 cu. yd. 1 grm. gold $0.0646.

By O. H. PACKER.



Metallic Sulphides in Alluvial Gold Deposits

By F. Lynwood Garrison

The main purpose of this communication is one of inquiry and suggestion. I have been for some time quite curious to know how hydraulic and gold-dredging operators manage when they have considerable quantities of auriferous iron pyrite in the black sand of the 'clean-up.' To discard this material is to incur a seemingly unjustifiable waste of gold, yet in the absence of mechanical (magnetic) concentration, or a chemical (metallurgical) treatment, such a loss is unavoidable. The gold-bearing tendency of pyrite is well recognized; it is not, however, always auriferous, even in gold-producing districts, but it is never safe to assume an absence of gold in it without definite tests by assay. The condition in which the gold is held by the pyrite need not be considered at present. It is sufficient to say it is probably both mechanically and chemically combined with the iron sulphide. Evidently that part mechanically associated will yield to amalgamation and the more readily if the sulphide is oxidized by roasting. In his paper on the 'Origin of the Gold in the Rand Banket', J. W. Gregory says, "Pyrite is so easily oxidized, and is so brittle, that its occurrence as pebbles in a placer deposit seems highly improbable."[1] George F. Becker, in discussing this phase of the subject, says: "As far as the fresh-water placers of America are concerned, there is no room to doubt the frequency of the occurrence of pyrite pebbles. For generations prospectors on the Pacific slope have recognized that rounded pebbles of pyrite afford an excellent indication of the presence of placer gold."[2] In the gold-bearing beaches of the Seward Peninsula, Alaska, pyrite is of such frequent occurrence as to occasion no comment. Indeed, instances of the presence of pyrite in alluvial gold deposits, in different parts of the world, might be multiplied many times, hence it is evident Mr. Gregory is mistaken in his conclusion as above quoted. It is not my intention at this time to enter into a discussion of the gold deposits of the Rand, but to call attention to gold in the pyrite commonly found with the black sand of many alluvial deposits. When the gravels are so rich they may be worked by hand, the proportion of gold thus contained and retained by the pyrite is relatively small, and may be neglected. When, however, the gold tenor is but a few cents per cubic yard, it would seem desirable that the gold of such pyrite add its increment to the total recovered. It is difficult to ascertain the proportion of gold lost in dredging and hydraulic operations; it must, of course, vary within wide limits; probably in most instances the recovery is not over 70 to 75% of the prospect value. It is stated that at Oroville, California, as much as 2½c. per cu. yd. of gold is sometimes lost; this evidently is too much. It is perhaps due chiefly to an extremely fine state of division of the gold particles; probably the actual loss thus sustained is seldom or never known. In the beach deposits of the southern Seward Peninsula, both iron and arsenical pyrite are common. In some places this pyrite carries gold, but at others none, or very little, is found by assaying. It is immaterial whether or not the pyrite in the gravels comes from gold veins or is due to concretions, probably both sources have contributed some proportion; in either case the iron sulphide is likely to carry gold; that in the concretions being deposited contemporaneously with the formation of the concretions. According to Skey, "one part of pyrite will precipitate more than eight parts of gold."[3] It has been repeatedly shown that nearly all natural metallic sulphides will precipitate gold from auric chloride solutions. It should be borne in mind, however, that although it is easy to obtain a gilded pyrite in laboratory experiments, it is never found in such condition in nature. Microscopic crystals of gold deposited on pyrite in alluvial deposits, under natural conditions, are not uncommon, but it never occurs as a uniform film on the sulphide, except when artificially produced.

According to J. Malcolm Maclaren, "The high tenor of gold in certain pyrite deposits in the gravels of southern Siberia, British Columbia, and elsewhere, suggests the possibility of some of the placer gold in these regions having been derived directly from the decomposition of auriferous pyrite, itself probably of secondary origin."[4] J. E. Spurr calls attention to the pyrite frequently found in the gulch gravels of the Yukon gold district, Alaska. Here it occurs sporadically disseminated in the schists, and finds its way into the gravels as the result of erosion. It is a common practice of the more economical miners in this district to separate the black sand with a magnet, then roast, grind, and pan the decomposed pyrite. In this way considerable gold is obtained."[5]

In California the question of saving the pyrite, or rather the recovery of the gold in it, does not appear ever to have been seriously considered, possibly for the reason that it is not present in sufficiently large amount to attract special attention. In Alaska they appear to have trouble enough in large operations, without bothering about the pyrite, but there are localities, such as some of the rivers in Colombia, South America, where the andesitic country-rocks carry so much of this material that the resulting gravels are full of it. In panning, of course, the pyrite washes off with the black sand, but in large operations, unless saved, it seems to be a means of serious loss of gold. It is unfortunate that there are not some reliable data relative to the gold value in such pyrite. As far as I am aware, no careful systematic tests, or sampling, with this object in view, have yet been made.

[1] Trans. Inst. Min. & Met., Vol. XVII, pp. 35-36.

[2] *Economic Geology*, Vol. IV, p. 377.

[3] Trans. New Zealand Inst., III, 1870, p. 225, quoted by J. Malcolm Maclaren, 'Gold,' London, 1908, p. 108.

[4] Maclaren, *loc cit.*, p. 85.

[5] Eighteenth Annual Report, U. S. Geol. Surv., Part 3, pp. 323-391.

Discussion

[Readers of the Mining and Scientific Press are invited to use this department for the discussion of matters pertaining to mining and metallurgy. While we do not hold ourselves responsible for the opinions expressed by correspondents, we reserve the right to edit communications, and to refuse to publish those which we consider unsuitable.]

Importance of Prospecting Vein Walls

The Editor:

Sir—The following results of a mine examination may be of interest to the student as well as to the mine owner. The importance of cross cutting into the vein walls or at least of putting in a drill hole now and then, was in this case clearly demonstrated. Many a miner has run alongside his vein until some accident, such as a misjudged shot or a cave, has revealed the unexpected treasure. This particular case described was where a small vein had been followed by an adit for several hundred feet, the foot and hanging walls being apparently without a break, but on close examination the walls showed evidences of faulting previous to the formation of the vein, for the vein itself was regular and without a break. To make sure that nothing was being overlooked, holes were drilled into the walls near the breaks referred to. The results of assays of cuttings from holes drilled into the walls, and of assays of samples taken across the material after shooting the holes, are of interest. It will be noticed that there is a wide discrepancy between the value of ore as shown by the drill-holes and of that obtained by sampling. This is only natural, for two reasons. First, the drill-hole may or may not strike a good portion of the vein, and second, less drillings come out of the hole for each consecutive inch, the starting drills having wider bits and cutting more rock than the smaller bits in the deeper portion of the hole. Where an upper and lower hole is tabulated, one is directly under the other.

Hand samples of vein.

Position of hole. Feet.		Depth drilled. Inches.	Gold per ton.	Width of ore. Inches.	Gold per ton.
20	Upper	24	$27.04	24	$64.10
	Lower	27	19.24		
25	Upper	18	21.73	24	93.00
	Lower	24	21.73		
30	Upper	18	33.35	24	10.33
	Lower	26	10.33		
35	Upper	20	2.06	24	43.40
	Lower	12	51.67		
40	Upper	12	2.06	24	18.60
	Lower	24	31.00		
45	Upper	24	20.67	24	19.12
	Lower	30	20.67		
95	Centre	18	47.54	18	22.73
100	Upper	18	4.63	18	20.67
	Lower	14	15.45		
105	Upper	18	1.03	18	37.25
	Lower	18	17.50		
110	Upper	18	30.47	24	13.90
	Lower	3	5.00		
115	Upper	18	1.03	24	1.03
	Lower	18	0.50		

The vein which had been followed by the adit averaged about 12 inches in width and assayed from a trace of gold to $1.0 per ton, but at the points where the walls assayed the highest the ore proper was found to be lowest. On shooting out at 115 ft. the wall vein was seen to have a strong vein which accounts for the assays being so poor. On a lower level of this mine a hole was drilled into the wall near a break and each foot of drillings kept separate with this result. At 150 feet: first foot $4.10, second foot $10.33, third foot $47.60. Here again is an indication of an orebody in the walls close to the vein previously followed and where the walls were of better grade than the defined vein. Sufficient has been shown to demonstrate the importance of carefully examining the walls of a vein no matter how regular they may be, and particularly at or near places where the walls have the appearance of having been broken by a slip or fault.

ALGERNON DEL MAR.

Fort Bidwell, California, December 1.

Tin Smelting

The Editor:

Sir—The note in the *Mining and Scientific Press* of November 12, appears in error, unless the practice of tin smelting has been radically changed since my period of activity in the business—a matter of thirty years. I believe Mr. Carter has confused the manufacture of tin plate with tin refining. The latter, a simple matter of liquation and boiling or 'tossing,' is invariably performed at the smelter, and three trade products, 'common,' 'refined,' and 'grain' tin separated if required. The output of Cornwall is, I believe, yet smelted, with or without, foreign tin ore at the local smelters, and the refined metal shipped to the best market. South Wales is the seat of the British tin-plate industry and much of the Cornish tin finds its way there, not for refining purposes, but to coat steel plate in the manufacture of the tin plate of commerce. The tin plate works are situated in South Wales because the steel mills and coal mines are there. Tin forms less than 3% of the weight of the finished tin plate. The finest tin-plate works in the world are in the United States. The term 'block tin' derives its origin from having been cast in blocks of 448 lb. The term is much used in Cornwall to distinguish between tin ore called 'black tin', and metallic tin called 'block tin.'

Denver, November 18. PHILIP ARGALL.

The Editor:

Sir—I notice in your issue of November 12 an inquiry by G. H. Carter relating to the smelting, refining, and use of tin in Great Britain. The metallurgy of tin is kept more secret than any other branch of the art. The Cornish smelters never divulge anything, any more than do the Straits Trading Co. at Penang. The works are strictly private and none of the scientists are allowed to breathe a word. The German smelters sometimes write something about their practice in mixing various ores, but do not impart much information. The Cornish smelters produce a completely refined article, and the Swansea tinplate manufacturers do not do any

refining. The smelting is done in Cornwall because the ore is on the spot and it is easy to bring the fuel from the South Wales coalfields. Foreign ore and concentrate is brought to Cornwall especially from Bolivia and South Africa, but most of this imported material nowadays goes to the works near Liverpool, where both Strauss and Williams-Harvey have erected smelters. Fuel is just as convenient there as in Cornwall and shipments are easier arranged. In addition, much of the tin there produced is used in the Lancashire and Midlands alloy trades, so that the market is nearer than in Cornwall. It is quite a usual mistake in America to suppose that tin is smelted in South Wales. Nothing is done there, and the trade is confined to tinplate manufacture. It would be a most uneconomical procedure to make tinplates in Cornwall, for the steel sheets are made in South Wales, and would, together with the fuel, have to be sent to Cornwall. Besides, South Wales is nearer the home markets for plates and nearer the shipping ports for the export trade. While writing of tin smelting in Cornwall, I may say that much dissatisfaction is continually being expressed by the Cornish miners at the present method of selling tin concentrate by public tender at the fortnightly ticketings at Redruth. The prices obtained are lower than those offered in private contract by German smelters. As a matter of fact small amounts are sold to German firms, but it has to be done surreptitiously. If a regular producer dropped out of the tin ticketings, the heavens would fall or something equally in the nature of a cataclysm would happen.

EDWARD WALKER.

London, November 23.

Laboratory Agitation Apparatus

The Editor:

Sir—In the *Mining and Scientific Press* of September 24, 1910, George A. James gave a method of air agitation for laboratory experiments, from which method I evolved the following scheme.

Instead of a flask turned upside down, a Squibb's separatory funnel is used. The ore and solution having been introduced into the funnel, close the funnel with the glass stopper, and mix thoroughly by shaking. The funnel is now placed in a stand, and the glass stopper replaced by a one-hole rubber stopper, which is connected by a glass tube and heavy wall rubber tubing with a filtering pump. The pump is started, thereby creating an incomplete vacuum on top of the solution in the funnel. Slightly opening the lower stopcock has now the effect of drawing the atmospheric air through the pulp and solution, resulting in efficient agitation. More than one test can be made at the same time by connecting the lower stem of the first funnel with the top of the second one, and so on, admitting air to the stopcock of the last funnel. In case of light slime, where only slight agitation is required, ordinary flasks may be used with two-hole rubber stoppers. The air is admitted through a glass tube (through the stopper), nearly reaching the bottom of the flask and is pulled away through a tube (in the other hole in stopper), which goes only a short distance in the flask and does not reach the top of the solution. The contents of several flasks can be agitated simultaneously by connecting the tube for admitting air into the first bottle, to the tube removing air from the second one, and so on.

B. W. BEGEER.

San Francisco, November 23.

Avino Mines Company

The Editor:

Sir—In your edition of November 26 I notice a letter from J. Parke Channing, in answer to my communication of October 21, in which he states that he believes the presence of tetrahedrite in Avino ores caused the trouble in concentration—"this being the main carrier of the silver." The two tailing dumps at the mines—resulting from water concentration and lixiviation, respectively—are still in evidence against the conclusions drawn by Mr. Channing. It is quite apparent from his letter that he is not personally familiar with the property or the character of these dumps. He states that the concentration, aside from loss in silver, was good, and further states that lixiviation was carried on very successfully. The two tailing heaps have both been thoroughly sampled, and the results show that the silver contents of the lixiviation tailing are higher than the tailing from water concentration, while of the "other metals" for which he claims a good extraction, copper and lead are higher in the tailing from water concentration than in that from lixiviation, so that his point is not well taken. Mr. Channing's informant could not have been familiar with the contents of these two tailing heaps. The results of milling and sampling tailing do not indicate the enrichment of the ore in silver by the presence of tetrahedrite.

If the concentration of the ores was successful, except for losses in silver and lixiviation, why did the property come to grief and require re-organization three different times in order to raise funds to continue operations? It is only a short time ago that two experts examined the property and recommended erecting a concentrating plant to re-handle the concentration tailing, seeing in it a sufficient asset to warrant further prospecting of the mine and further testing of the ore by water concentration. All this was to be accomplished from the revenue derived from the concentration of the existing tailing, the principal return being expected from the copper content.

RALPH NICHOLS.

Gilmore, Idaho, December 2.

Filter-Pressing Slime

The Editor:

Sir—With reference to the article by M. W. von Bernewitz on 'Filter-Pressing Slime', which appeared in your issue of September 17, the filter-press mentioned in the last paragraph as having been used by Alfred James was invented by me while in Kalgoorlie in 1905, and patents secured in New Zealand, Australia, South Africa, Mexico, United States, and Canada.

J. CHISHOLM.

Pavda, Voviya, Perm, Russia, October 14.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions, and give information dealing with the practice of mining and metallurgy.

It is poor business to build a mill on a prospect or even a mine having extensive development before there is enough ore in sight to at least pay for the mill. This axiomatic proposition is too often lost sight of, or ignored.

Faults frequently intercept the continuity of veins. If your vein has faulted and you cannot find it, employ a geologist. He may lack mining experience, but he possesses valuable geological knowledge, and in that you may be deficient.

Oil-land withdrawals now outstanding, including some private lands within the exterior limits, aggregate 4½ million acres, and are comprised within the States and Territories of Arizona, California, Colorado, Louisiana, New Mexico, Oregon, Idaho, and Wyoming.

A fractional claim is not infrequently found by some wide-awake fellow in the heart of an old mining district. Have a good careful look at the mine map of the district. Fractional claims, however, are often of such shape that no extralateral right can be secured.

New milling machinery installations should be carefully considered. Be sure the machinery you have in mind is suited to your ore. A little investigation along this line may save you thousands of dollars, and may mean the difference between success and failure.

Gold frequently occurs in quartzite, and when such is the case is usually found to be accompanied by intrusive rocks. There are exceptions to this, however, a noted instance being the Gold Mountain mine in the Blackhawk Mountains in San Bernardino county, California.

Close concentration of copper ores is one of the most difficult problems of the metallurgist. The refinements of concentration may easily be carried far beyond the limit of economic success. Millmen seldom aim to make an ultimate saving exceeding the cost of profitable operation, although such saving may easily be within the range of mechanical possibility.

Extensive surface mineralization is a feature of nearly all great mines. The valuable ore may be lacking on the surface, but evidences of a vein fissure, the rocks bleached or deeply stained with iron or other oxides, softened by oxidation and crushed by pressure and movement, are the principal phenomena that are evident on the surface of a great mine. To these conditions there are exceptions, but not many.

Large beds of fragmental material in gulches or depressions cemented by iron oxide, suggest to the average geologist the presence of iron-bearing springs in the vicinity, and in not a few such instances it has been found on examination that the springs issued from a lode or vein of peridotite or serpentine often containing copper not rich, perhaps, but certainly justifying prospecting, particularly below water-level.

Surveys of the public lands were long made by contract, but Congress at the last session increased the appropriations over former years and authorized the abandonment of the old method of making surveys. The reports thus far received from the surveying forces of the Department of the Interior indicate that the surveys are being made under the new system at a reduced cost per acre, and at a very great increase of speed. Surveys that have had heretofore to wait years for examination will now be adjusted and approved, on receipt of data from Government surveyors, without delay.

Malachite, the green copper carbonate, is not the only green mineral. There are other green ores containing copper, and several ores and minerals of green color that contain no copper. Among these latter are the green micaceous magnesian mineral, mariposite; omphacite, a green pyroxene; variscite, a hydrous aluminous phosphate which has a deep emerald-green color; glauconite, an iron silicate, occurs abundantly in some sandstones, and as incrustations and filling cavities in eruptive rocks; vivianite, a hydrous ferrous phosphate, though generally blue, is sometimes green, and is often mistaken for azurite or malachite.

The silicious gold ores, as they are called, of the Black Hills occur in Cambrian formation and are either mineralized quartzite, or silicified lime shale lying upon the quartzite. The ore contains a small amount of tellurium associated with the gold. Few of these ores, either oxidized or unaltered, prospect in free gold. The value can only be ascertained by assay. The ores have been treated by smelting, by barrel-chlorination, and by cyaniding, the latter being the most commonly practised. The unoxidized ores have as yet not been treated with marked success, and the solution of this metallurgical problem offers a substantial reward to the one who can overcome the difficulties.

The cost per ton of operating any kind of a mine must be determined wholly by the conditions under which the mine is operated. Size and character of the vein, hardness of the ore, cost of labor, amount of water and waste to be handled, magnitude of operations, and the expense of metallurgical treatment, all have to be considered, as well as the situation, transportation facilities, and other details. Tabulated statements of cost can only give the searcher after information an idea, at best, of what the cost in an untried place will be. It may be approximated by estimate, but trial is the only way to arrive at it arbitrarily, as is shown by the lowering of costs at certain mines by change in method or to some other circumstance.

Special Correspondence

JOHANNESBURG, TRANSVAAL

Knights Deep, and Simmer & Jack East.—Review of the Year's Operations.—The New Rietfontein.

The annual meetings of two subsidiaries controlled by the Consolidated Gold Fields of South Africa have been held at Johannesburg during the past few days. The two companies referred to are the Knights Deep and the Simmer & Jack East, two of the most important deep level properties in the Germiston mining area. The fiscal year of these companies terminated on July 31. During the period under review the Knights Deep earned a profit of over £300,000, while the balance to appropriation was £325,810. The company paid out 30% in dividends, the amount absorbed in payment being £193,057. Taken altogether, the results of the year's operations may be considered quite satisfactory, and an increase in dividend payments was predicted by the chairman. At the end of the fiscal year, the ore fully developed in the property amounted to 1,700,000 tons, in addition to which there are large ore-bearing areas which are not included in the above, but which are opened up for mining. The interesting statement is made that only a limited amount of work remains to be done to complete the development of the mine. The ore reserves of the Knights Deep Co. are valued at 5.5 dwt. per ton, the recovery secured during the 12 months having been only a little over 21s. per ton. In the previous year the yield was 23s. 11d. The reduced value per ton has been largely counterbalanced by a reduction in the working costs from 14s. 5.3d. to 12s. 3.1d. per ton, and this in conjunction with the larger tonnage milled has resulted in an increase of £4000 in the actual profit earned. The reports of the Knights Deep Co. should convince the most skeptical that with good management, areas of less than even 5 dwt. value per ton can be turned to profitable account in Rand deep levels. Much less satisfactory have been the results secured by the other subsidiary, the Simmer & Jack East. During the twelve months ended July 31 last, this company made a profit of £64,148, or, including sundry revenue, £71,920, as compared with £82,986 in the previous year. Difficulties have attended the working of the property during the period under review, chief among which have been a continuous shortage of native labor and the unsatisfactory developments in the bottom workings from the Hammond & Western shaft. The area opened by the Eastern & Lohse shaft, too, has not been productive. At the end of the financial year the ore reserves were estimated at 950,000 tons of an average assay-value of 5.4 dwt. per ton, as compared with under 750,000 tons of an average assay-value of 5.8 dwt. per ton, at the end of the previous year. The increase in the ore reserves is largely due to the inclusion of areas of low-grade rock which were not considered in previous estimates. The recovery secured during the year under review was 21s. 5d. per ton, as compared with 22s. 4d. in the previous year. A reduction in working expenses from 18s. 5d. to 17s. 10½d. was effected at the same time. The Simmer East is unquestionably one of the most difficult properties on the Rand at the present day. The position with regard to the ore reserves occasions anxiety to the management, and the margin of profit is by no means satisfactory when one takes into consideration the large amount of capital invested. The company has 200 stamps and 3 tube-mills, but on account of the shortage of labor and the state of development, it has been deemed inadvisable to operate more than 130 stamps, and the remaining 70 have therefore been leased to the adjacent mine, the Knights Deep. Strenuous efforts are being made to better the conditions underground and all efforts are being directed to exploring the lower portions of the mine.——The affairs of the New Rietfontein Estate Gold Mines, Ltd., a company working the du Preez Reef series to the north of Germiston, have given much cause for anxiety to the shareholders of the company for several months past. Of late the grade of the ore has been falling steadily, and as the mine is one in which conditions do not lend themselves to cheap working, the management has been quite unable to counteract the decline in value per ton by a lower rate of operation. The profit earned by the New Rietfontein company during the quarter ended September 30, 1910, was only £989. During this period a further decline in grade adversely affected the returns. It has now been decided to make special efforts to reduce the stoping widths on the reefs, and with this end in view all stoping by rock-drills has been suspended. It is trusted that this will result in an improvement in grade, although it will have the effect of reducing the quantity of ore milled.

TORONTO, CANADA

Railroad to Porcupine.— Interest in the New Camp. — Mining Affairs at Cobalt,—Mineral Production of Ontario. — Test Case Decided.

Porcupine is more in the ascendant than ever since the Ontario Government, on November 30, announced its intention of building into the camp a branch of the Temiskaming & Northern Ontario railway from the main line near Kelso. The proposed line will be about 30 miles long, and it is proposed ultimately to continue it five miles farther to the Metagami river. J. L. Englehart, of the T. & N. O. Railway Commission, expects to have the line in operation to Porcupine by July 1, as there are no serious engineering difficulties. A little trouble has arisen over a charter granted some time since to local interests empowering them to build a line to Porcupine connecting with the main line near Matheson. This charter is now declared forfeited, owing to the failure of the holders to undertake the work within the specified time limit. Their interests were acquired by E. A. Wallberg, who commenced work, and has now a force engaged on it. Legally he has no claim, but no doubt some adjustment will be made. As the result of the Government's action, a large number of Porcupine properties are changing hands at high figures. A revival of wild-catting is feared, and the Government is endeavoring to meet the situation by stringent legislation. Frank Cochrane, Minister of Mines, goes to Porcupine next week to inspect the camp, and on his return the question will be seriously considered; meanwhile the existing protective laws will be strictly enforced. It may be doubted whether the astute promoter will be successful in duping investors, as they have been bitten so often that they are becoming cautious. Shares in those Porcupine companies which have already thrown out the bait of cheap stocks are selling slowly, and it may not be easy for even those having sound and reputable enterprises to obtain money. The winter roads into Porcupine are in good condition, and machinery, supplies, and construction material are being hauled in rapidly. Among the sales of Porcupine properties reported are the three Walsh claims under option to Montreal and New Brunswick capitalists at $50,000; the Maiden-Macdonald group, for a price stated to be $250,000; the Josey group Deloro, for $150,000; and the two Knapp claims for $36,000. The holdings of the Timmins brothers and their associates, by purchase or under option, amount to 50 claims. A deal has been put through by which the Gode-Burns claims pass to Toronto purchasers at a figure close to $100,000. H. Van Cutsern, a London financier, is now looking over the field with a view to investing.

There is little news from Cobalt lately, and the market is again sagging, due partly to attention being centred on Porcupine, and partly to the approach of the holiday season. The most noteworthy incident has been the declaration of the McKinley-Darragh company of the regular 3% quarterly dividend, accompanied by a 12% bonus. Reports from the La Rose are favorable as regards the recent finds on the main property, and the Lawson, which is improving as development proceeds; but notwithstanding the excellent physical and financial condition of the mine, the prospect of a speedy return to the former rate of dividend is a vanishing one, as the management appears determined to continue a conservative policy. The Temiskaming company is mining at 500-ft. level and making preparations to sink. The Black mines have a vein of cobalt at 270 ft. in the winze which

is being put down to the 200-ft. level and this is the best showing of ore made. The ore is [illegible] grade and 200 ft. north of the No. 1 shaft, and east of the Kerr Lake line, [illegible] Hargraves, [illegible] ore. The stockholders of the Hargraves Silver [illegible] the directors to raise $[illegible] for [illegible]

A statement of the output of [illegible] and works for the first nine months of the year issued by the Ontario Bureau of Mines shows the silver production to be 19,[illegible],[illegible] oz. valued at $[illegible]. The ores of [illegible] aggregated 2,[illegible] tons, of which 16,[illegible] tons were of ore and [illegible] concentrate. Nearly all came from Cobalt [illegible] Government statement for [illegible] Lake 17 tons, Seven Trust 9 tons and the production of the Lake Superior district was small. The production of nickel-silver in Canada [illegible] was 10 tons 5[illegible] oz. and for the corresponding months of 1909 it was 18,[illegible] oz. valued at $[illegible]. Considering what was produced would result from the [illegible] of existing power and the increase of concentrating mills, etc., this small [illegible] is disappointing. The gold production shows an increase, owing to the output of Porcupine, the value for the nine months being $28,729, as against $[illegible] in the corresponding period last year. Nickel and copper show increases of 50 and 28 respectively, and pig iron was this year produced to the extent of [illegible] tons, valued at $[illegible], as against 294,698 tons of the value of $4,095,715 last year. —— Chancellor Sir John Boyd has given a noteworthy decision in a test case brought to decide whether the owner of the surface rights in land, in the deed of which the minerals and oil have been reserved, owns any natural gas which may be discovered. A number of farms in Kent and Elgin counties, Ontario, are held under such titles, the minerals and oil having been reserved by the original owners. The discovery of oil and natural gas and the operations of the companies which purchased the mineral rights, caused the farmers much loss and annoyance, and application was made to the Government for relief. The latter agreed to bear the expenses of a test case to decide the legal rights of the companies, and the court held that the reservation was valid so far as minerals and oil are concerned, but that natural gas was not a mineral, and consequently belonged to the owner of the surface rights. The companies therefore have to account to the landowners for all profits realized from gas.

FAIRBANKS, ALASKA

New Stamp-Mill at Chena. — Progress of Development on Quartz Claims on the Tanana.

Many of the people of Fairbanks and vicinity went to Chena on November 1 to see the new stamp-mill formally started. Mining men of this part of the country see in the operation of this mill the beginning of the era of quartz mining and the recovery of the gold by milling methods. While quartz development has only commenced, there are many good prospects, and the building of this mill offers a ready market for custom ore. The present outlook is much brighter, although there will be practically no stoping ground opened up till the end of November. By the first of the year Griffin, Harris, and associates, who erected this mill, probably will have sufficient ore to keep the plant operating. Some of the larger properties, any one of which would be able to supply enough ore to keep a mill of this capacity in operation, probably will order mills next summer.——The Frederick property is now being developed by Ernest Peterson, having a lease on the upper shaft, and Glazier, Crockett & Poulson, working the lower. The lower shaft has a depth of over 90 ft. and the first level from it will soon be started. The upper shaft is down over 50 ft. At 90 ft. a rich shoot of ore has been opened.——The Spaulding-Clough and extensions, at the head of Dome creek, are being developed by Huddleston Bros. as lessees, who have buildings and machinery in place; the shaft is down 60 ft., in which there is a showing of shipping ore. Stoping may begin here by the first of the year.——The group of claims on Fairbanks creek, owned by Cook Bros., Lockhart, Hastings and Dunn, will [illegible] by the Cleary and Darling [illegible] A [illegible] ft. shaft is down, and at the Cleary claim [illegible] developing the ground on a [illegible] Close to Chena proper the Alaska [illegible] Mining Co. with [illegible] of the old [illegible] has put [illegible]

The left limit of Pedro creek, from the [illegible] where Lessee McGuire, Zimmerman and Kellum are [illegible] down to 5 Above Discovery, seems to be one of the most [illegible] [illegible] on the district. [illegible] and A. Scofield have recently leased the Swanson and Lacey bed claims from Hoffmeister, Boyd & Co. These claims lie in the middle between the heads of Chena and Eldorado creeks. The shaft is down to 70 on a [illegible] ft. vein, samples taken from which assay at $[illegible] to $[illegible] per ton. —— The local test mill at Fairbanks has just finished running a 12-ton lot of ore from the Trocvata properties on Willow creek, and 9 lb. of amalgam was cleaned up. The

Chena Custom Mill.

bar being valued at over $1100. Another 2-ft. vein has been found on this property, the ore from it assaying well. On this property some stoping ground has been opened. — A shipment of ore from the Thomas lease, on the Wild Rose claim, is awaiting treatment at the local mill.—— Prospecting above an open cut at the head of Fox gulch, that has yielded coarse gold, has led Freeman and partner to a 4-ft. vein, assays of the croppings showing as high as $20 per ton. Further work is being done to determine the extent of the find.——What seems to be a strong vein on Gilmore creek is being prospected by Laite and partners. Eight claims have been staked and the vein is exposed by four holes on each claim. At no place is the vein less than 6 ft. wide, the ore running up to $12.——Joe Cook and partner have struck two veins on First Chance creek, a tributary of Goldstream. Besides the strong evidence of scheelite, for which the ground was originally prospected, a good trace of gold was followed to a 2-ft. vein of quartz. The bottom of the shaft is just beginning to show good ore.

KALGOORLIE, WESTERN AUSTRALIA

Rich Ore in Bullfinch and a Rush to a New District. — Investigations of Pulmonary Diseases in the Goldfields.—The Associated Company.

Probably the most discussed mine in this State, and perhaps in Australia, at present, is the Bullfinch, and one of the most envied of mining men is its owner, D. Doolette, late manager of the St. George mine of the Great Boulder No. 1, in the Murchison. It came about this way: Mr. Doolette has had a prospector named Jones out in different parts of the goldfields, who some months ago pegged out a lease of 160 acres, named as above, about 25 miles north of Southern Cross, in the Yilgarn field. Work was carried on until two months ago, when results were published, backed up by three fine crushings. A lode some 1000 ft. in length has been disclosed containing a series of veins of iron gossan, and quartz in greenstone, that are wonderfully rich in gold. The ore occurs where there is a fault in the country. The iron and quartz outcrops are quite numerous, and if no gold is visible on the surface, they are looked upon as valueless. It appears that, at the Bullfinch, panning does not show the full value, assays giving

much more than is expected after seeing the pan samples. Not much notice was taken of the find at first, but when the first crushing of 60 tons returned $7500, a second about the same, and the third of 200 tons yielded $33,000—a total of $48,000 from 324 tons—a rush for the district set in, the like of which has not been witnessed since the discovery of the Coolgardie in 1902, and Kalgoorlie in 1903. Crowds of prospectors, miners, teamsters with their wagons, mining engineers, geologists, and speculators are flocking to the field. Syndicates have been formed, and companies floated locally and in the Eastern States to hold, develop, and speculate on the 2000 acres already pegged for miles north and south of the original claim. In two cases gold has been found, but shares in syndicates have risen to enormous and absurdly high prices—$50 to $3500 each—simply on the strength of an option on a base nearby. Almost every lease has been given the name of some bird, such as Bullfinch, Bluefinch, Chaffinch, Crossfinch, Goldfinch, Greenfinch, Bullfinch Extended, Deeps, Junction, and South, Bronzewing, Golden Eagle, Eaglehawk, Cocksparrow, Bull Ant, and the like. It is said that even greenstone outcrops have been pegged, and the place is booming for all it is worth. Owners of leases are simply sitting down waiting for buyers, and little legitimate work is going on. The country is heavily timbered with gum, and water is scarce and has to be carted 25 miles, costing 8 cents per gallon delivered. This will soon be remedied, if the leases prove profitable to work, by laying a pipe from the water scheme main. A township is being surveyed, and no doubt sites will command a high price. Last week's report from the Bullfinch shows 10 ft. of ore averaging $350 per ton in the north drift, 100-ft. level of No. 1 shaft; 10 ft. of ore worth $465 per ton at the 50-ft. level, No. 2 shaft, south drift; while in a water shaft the crosscut west to the hanging wall shows the lode to be 20 ft. wide and the ore worth $30 per ton. In No. 2 shaft specimen ore worth from $400 to $8000 per ton has been bagged for treatment at Kalgoorlie. The Southern Cross field has been gradually coming to the fore during the past year, as such mines as the Marvel Lock, Mountain Queen, Transvaal, Corinthian leases have drawn attention to the centre. What is liked about the Bullfinch, is that it is in greenstone country, and in Western Australia the best mines are in this rock; notably the mines at Kalgoorlie. As regards the treatment of the Bullfinch ore, it may be said that the gold is fine and little of it free. One lot of 200 tons was treated at the Associated Northern mill and averaged $160 per ton. The ironstone, which carries 60% FeO, is the only mineral that might give trouble.

Western Australia, Showing Bullfinch District.

From time to time in these notes, mention has been made of the Commission that was taking evidence on miners' pulmonary diseases in the different goldfields. The report is now at hand, and it is of great value and interest to all. Dr. Cumpston, the commissioner, suggests discarding the term 'phthisis', as it really means tuberculosis of the lungs in the ordinary sense, not including the changes that occur in the lungs due to dust; and using the term 'fibrosis' as being the more precise. This includes only the changes produced by dust, and does not refer to the changes produced by the tubercle bacillus. Of the 2050 men examined, 1805 were actually at work, and were examined under conditions as nearly as possible identical with the actual conditions under which they carried on their work. These revealed the following facts: (a) Early fibrosis was present among machine miners to the proportion of 33.16%; among non-machine miners to 7.23%; trammers, to 3.1%; and dry treatment mill hands to 24.5%. (b) Intermediate fibrosis was found among machine miners and non-machine miners; late fibrosis was found only among machine miners. (c) Pleurisy was found to be present in men engaged in different classes of mining. (d) Tuberculosis of the lungs was present in a total of 28 cases, that is, 1.5%. (e) Early fibrosis was most commonly present among machine miners and dry treatment mill men, and among those to an important extent. (f) Early fibrosis seems to make its appearance most frequently about the second year of machine work. Tuberculosis of the lungs is not yet present among miners in Western Australia to any alarming extent. The evidence seems to point fairly definitely to the infectious nature of tuberculosis of the lungs; and seems to indicate that the disease must be regarded in the light of infectious rather than an industrial disorder. Therefore, it appears certain that the action of dust does predispose to the action of tubercle bacillus. Briefly, the effects created by the presence, within the lung, of dust, are inflammatory changes throughout the lung substance, resulting in fibrosis, and the ultimate effects are: (1) diminished area of lung tissue available for the purification of the blood; (2) diminution in the amount of air which can reach the lungs; (3) diminution in the amount of blood which can reach the lungs. In conclusion, it is pointed out that, from experiments made and pathological evidence, it seems clear that dust, and dust alone, is responsible for fibrosis. No mention was made in the report of the effect of the coarse dust from the machines underground, and the fine dust in the dry-crushing plants. The matter rests there, and it remains to be seen what steps will be taken to minimize the trouble generally.

The Associated company is erecting two more Edwards duplex furnaces of 100-ton capacity each, making four in all. A No. 7½ Gates breaker, and exhaust turbo-generator are being installed. The exhaust turbo-generator of 1000 kw. is now working on the Horseshoe.

Returns for the month were as follows:

Name.	Tonnage.	Value.	Profit.
Associated	10,540	$ 70,000	$ *6,500
Associated Northern Blocks	1,850	20,000	10,000
Bullfinch	334	48,000	.....
Chaffers	4,375	32,500	1,500
Golden Horseshoe	23,414	168,000	1,600
Golden Ridge	2,500	30,000	14,000
Great Boulder Perseverance	18,952	117,000	16,000
Great Boulder Proprietary	18,004	246,000	144,000
Great Fingall	10,857	84,500	14,500
Hainault	5,820	35,500	4,600
Ivanhoe	19,465	202,000	100,000
Kalgurli	10,805	137,000	75,000
Lake View & Star	12,042	76,000	*21,000
Oroya Brownhill	21,639	27,800	16,000
Oroya Black Range	4,540	45,500	11,500
Oroya Links	10,023	59,000	2,200
Sons of Gwalia	13,504	118,000	49,700
Sons of Gwalia South	2,353	22,000	8,500
South Kalgurli	9,162	57,000	5,000

*Loss.

MEXICO

Activity in Pachuca District.—The Naica Lead Mines.—Palmilla and Veta Colorado.—Interest in Guanacevi.—Railroad Projects.

The recent disturbances in Mexico have been unfortunate for the business interests of the country. However, the reports of the outbreaks have been greatly exaggerated and as long as the Mexican army remains loyal to the established government there need be little fear of serious trouble.—The coming year will see a material increase in production in the Pachuca district of Hidalgo. The Real del Monte y Pachuca Co., controlled by the United States S. R. & M. Co., has increased the capacity of its Loreto reduction plant from 400 to 500 tons daily and is increasing that of its Carrizal mill from 250 to 400 tons. The Santa Gertrudis, now a Camp Bird property, will have its new 600-ton plant in operation by May 1. La Blanca y Anexas will soon start the machinery of its new 300-ton concentrating plant. Additions have been made to the equipment of the San Rafael plant and there is promise of an increased output the coming year. The Mexican Light & Power Co., now in control of the Pachuca power situation, has organized as a subsidiary the Pachuca Light & Power Co., with a capital of $1,000,000 and a bond issue of $1,000,000. Bonds of the par value of $5,000,000 are being offered in England. It is planned to

Pamilla Cyanide Plant, Parral District, Chihuahua.

transmit power to the Zimapan district, where it is believed greater mining activity will follow the introduction of cheaper power.—As the result of having made a favorable contract with the Torreon smelter for a term of years, the plans of the Compañía Minera de Naica for the erection of a 600-ton smelter at Concho station, on the Mexican Central in Chihuahua, have been abandoned. The company is now producing from 200 to 300 tons of lead ore daily. A railroad from the mines to Concho is operated by the company, the distance from Concho to Torreon being 347 kilometres.—The foundations of the 300-ton plant of the San Francisco del Oro Co., near Santa Barbara, have been laid, and construction work has commenced. Tests of the ore were made in England before the plant was ordered. It is expected that the plant will be finished and in operation by next March.——The Palmilla cyanide plant, near Parral, is ready for operation, and that of the Veta Colorado is expected to be finished by January 15.——The West Mexican Mines, Ltd., of London, proposes to erect a 500-ton cyanide plant for the old Rosario mine at Guadalupe y Calvo. It is hoped to have the first unit in operation early next year. The ore on the dump is estimated at 170,000 tons, some assays of which show an average value of $10 per ton. The company has 10,000 acres of timber land in that part of Chihuahua.

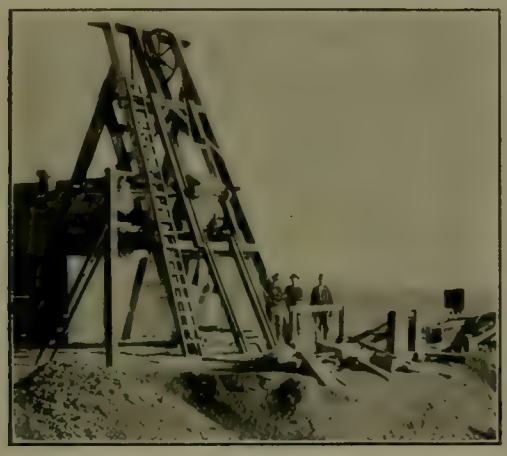
Work may be resumed soon on the project of the Guanacevi Tunnel Co., near Guanacevi, Durango. The company was formed in 1904 to drive an adit three kilometres to cut the principal veins of the district. The adit had been previously driven 1500 ft. The prospect of the Tepehuanes Guanacevi railroad being built is creating more interest in mining in the Guanacevi district.——Enrique Schondube, of Mexico City, is at the head of an enterprise the plan of which is to build a hydro-electric plant in western [illegible] and transmit power to [illegible] and Chihuahua. [illegible] is made that the bonds of the Mexicano del Centro R. R. Co. [illegible] taken in Paris. The project is to [illegible] from Camacho on the Mexican Central to Gomez Farias on the National going by way of Maxcalli. A concession was granted by the State of Zacatecas for the road some time ago to Gustavo A. Madero and a guarantee of [illegible] interest on the bonds necessary for 20 years was given by the State government. The plan includes the building of a branch to the Bonanza mining camp where the American Smelters Securities Co. is operating.—F. E. Olendorf of the Taxco district in Guerrero, has been granted a concession by the State government for a railroad from Naranjo on the National railway to Taxco, a distance of 32 kilometres. Mr. Olendorf's plans are of importance to the mining industry of Taxco district.——The National railway management is preparing to build a railroad to connect the Gulf ports of Tampico and Veracruz. The line will be 420 kilometres long and will open the oil belt of the State of Veracruz.

PIOCHE, NEVADA

A Touch of Early History.—Restrictive Policy of Railroad Company.—Merging of Great Properties.—Problem of Handling Water in Mines.

For the first time in many months Pioche seems to warrant the interest of the mining world. Vicissitudes seem to be pertinent to the mining industry, and they have distinguished to great extent the history of Pioche district. Beginning in the earliest days, the richness and abundance of the ores found made Pioche, next to Virginia City, the most talked-of mining camp in the world at that time. In 1876, with the collapse of the bank of California, Pioche went into eclipse, and failed to come out after that bank had been reorganized. For 25 years following that time the district has seen many bright hopes born, live a brief time, and fade into despair. It has seen many struggles, whose brilliant promise was ever doomed to disappointment. But through it all there has firmly persisted the evidence of intense mineralization, suggesting the certainty that eventually time would solve the problems and that the activity of its early days would return. Just before the San Pedro, Los Angeles & Salt Lake railroad went out on New Year's day in that awful cataclysm of flood, it looked as if the day of fulfillment was almost at hand, but that disaster left Pioche marooned for six months, during which time one after another of the mining enterprises had its wind choked off. When finally the railroad was reopened, the district was subjected to an experience without parallel in the history of Western mining development. The railroad company appeared to have conceived a violent antipathy to the region and a purpose to consistently discourage all revival of effort in it. Temporarily its accustomed train service was restored. This consisted of a small engine, a combination baggage, express, and passenger coach, and such freight cars as the traffic made necessary. This mixed train required one engineer and fireman, a conductor, and one assistant. The entire daily cost of operating with such equipment could not have exceeded $35 for the round trip. Of course the road itself had to be maintained in order to protect the franchise. Only two mines were started at first, but the traffic was ample to furnish a profit to the system. The Pioche branch, 32 miles long, is auxiliary to the main line, intersecting it at Caliente, its function being to feed the main system, and it can properly be regarded as a part of that system. Nearly every passenger on the branch either comes from some point on the main system or goes out over the main system some distance from Caliente. The freight which passes over it furnishes part of the business of the main system. The time-card for daily service remained operative a short time and was then reduced to three times a week, and after a few days again cut down to once a week. For the last twelve Mondays, Pioche has witnessed the advent of a mixed train, and has seen the train go out. The business on the branch has been such that the

small engine had to be superseded by a large freight engine, and even this engine has been inadequate to haul all the freight, so that it has been necessary to send several specials for that purpose. When the word went out that train service on the Pioche line had been reduced to an extent hitherto unheard of in Western railroading, it put an incubus upon the camp which would have proved fatal to any mining camp of less vitality; but the material resources of Pioche are known to the mining world, and fortunately one of the greatest powers in mining has had its attention directed to the district in recent months. The result has been that the Nevada-Utah Mines & Smelters Corporation has passed under a new management. It is believed in Pioche and by the mining men of Salt Lake that the dominating influence in this new management is the same as that in the Amalgamated Copper Co., or what is generally designated as 'Standard Oil.' Ernest R. Woolley, a mining man of large experience in the West, organized the syndicate which has taken over the Nevada-Utah and has been made president and general manager for the corporation. Harry C. Parker is engineer in charge of all mining operations, and Fred R. Woolley becomes financial agent, with headquarters at Salt Lake.



Prince Con. Shaft, Pioche, Nevada.

Operations are now in progress. The Nevada-Utah company owns some of the mines on the hill which were so productive in an early day, and also what is known as the Day mine, 15 miles northwest of Pioche; also a one-half interest in the Pioche Consolidated Mining Co. The last-named company was organized last year to take over a portion of the Nevada-Utah holdings and all those of the Ohio-Kentucky Mining Co. This settled the legal controversy which had become acute between those two interests and had effectually retarded development. The Day mine has been started up again and shipments begun. The old No. 5 shaft of the Nevada-Utah has been reopened. More machinery has been ordered, and it is announced that development and production will proceed as rapidly as is consistent with real economic progress.

The announcement has been authoritatively made in New York that arrangements have been perfected for merging with the Nevada-Utah the Pioche Con. and the Prince Con. Work is now in progress on the latter, in which the shaft is being sunk to the level of the old Nevada-Utah 1200, where it is proposed to connect by cross-cut with the famous 'black ledge'. This is the name by which is known the largest deposit of ore ever found on the old hill. It is a complex ore of lead, zinc, and silver, and will require special metallurgical treatment. It is also probable that the Centennial Pioche and the Pioche King will be included in the merger now being worked out. The Centennial Pioche Co. is sinking its shaft to the horizon of the blanket deposits of its neighbor, the Prince Con., of which the main incline shaft is only about 1400 ft. distant. Work has been resumed on the Pioche King, also. The Mendha was the first to resume after the railroad was reopened, and it has been a steady shipper. The grade of Mendha ore is better now than it has ever been since the company was organized, and the management is pushing development down to the 1000-ft. level, which has been nearly reached. There are reports that the Nevada-Mendha will also join the Standard Oil combination. The promise has been made, apparently with authority, that the branch railroad will soon be constructed from the Pioche depot to the Prince mine; that a concentrating plant will be erected on the Prince side of the range; and another concentrating plant on the Pioche side, to treat the lead-zinc ores of the Consolidated Pioche. Another report is to the effect that a large smelting plant is to be erected to handle the ores of the merged mines, to treat the large tailing dumps at Bullionville, and to smelt custom ores.——One of the most interesting questions concerning development in this district relates to the underground water. In the early-day mining on the hill, water was found at a depth of 1200 ft. below the collar of the main Raymond & Ely shaft. By means of a Cornish pump this water was controlled sufficiently to enable development to be carried down to the 1500-ft. level, where was disclosed the largest body of ore yet found on the 'black ledge.' Last year water was struck in the main shaft of the Prince Con. at a horizon several hundred feet higher than the 1200-ft. level of the Raymond & Ely. Two years ago developments in the Nevada-Des Moines Mining Co.'s shaft got water at an elevation more than 500 ft. higher than the 1200 of the Raymond & Ely. Last week water was struck in the Centennial Pioche at about the same horizon as in the Prince shaft. There have been thus far no developments which furnish conclusive evidence as to the volume of water which must be handled in order to permit mining to progress. The finding of water at these different horizons indicates that there is no regular connection between the sources of the different water-levels. Should a large volume eventually be disclosed in either mine, the result would be the development of agricultural possibilities of importance. If it were not for the attitude and conduct of the railroad company, Pioche would now be coming into the limelight and many mining men would be on the ground to investigate. Under present conditions any zeal in that direction is quite effectually restrained, and we cannot look for much activity in the camp excepting such as must locally follow the rapidly expanding activities of the mines now operative. The time will come before long when the railroad will be forced to furnish adequate facilities, and when that time arrives, it is probable that Pioche will be the centre of more activity than any other mining camp in Nevada.

NEW YORK

President's Message.—Crop Statistics. — November Copper Production. — The Foreign and Domestic Consumption. — Merging of Two Arizona Mines.—Tennessee Copper Company.

The overshadowing event of the week in the financial world was the President's message. As usual, its effect had been discounted. Hardly second in importance to the message of the President is the report of James Wilson, Secretary of Agriculture, which shows that the 1910 crop totals the staggering figure of $8,926,000,000. This addition to the country's wealth will eventually have its effect on financial activity and will force the market out of the rut into which it has fallen. The report of the Copper Producers' Association, covering November, was made public this week. Figures were about what were expected. Restriction of output is showing somewhat in refinery figures. The decrease in the accumulated stocks is 8,872,845 lb. November production was 119,353,463 lb.; consumption was 128,226,308 lb.—60,801,992 to domestic consumers, and 67,424,316 for export. It will be seen that the export demand is mostly responsible for the decrease in surplus stocks. American stocks now amount to 130,389,069 lb., the smallest surplus reported since the end of March. During the eleven months of the current year the

foreign visible supply has increased 19,120 tons, showing a net decrease of the world's accumulated stock of copper of 74,574 tons. While these figures put a much better face on the copper situation the weak point is the fact that this improvement has been only when consumption is cutting at record breaking figures. The foreign demand for metal has been unprecedented, and should it die off as might be expected in the natural course of business it follows that unless a more vigorous policy of curtailment were adopted the surplus would almost immediately become a burden. The consummation of the merger of the Calumet & Arizona and the Superior & Pittsburg makes the further elimination of the Cole-Ryan interests. The stock of the Calumet & Arizona is to be increased from $5,000,000 to $6,400,000, its present outstanding stock being $5,000,000. The exchange is to be made on a basis of three and a half shares of Superior & Pittsburg for one of Calumet & Arizona. Stockholders are to meet April 1, 1911, to ratify the increase of capital stock and the consolidation of the two companies.——Mining bonds with conversion privileges continue to hold a degree of public favor. The recent 6% bond issue of the Tennessee Copper Co. of $1,500,000, issued to refund some $600,000 of 3 year notes and a former issue of $350,000 5% bonds has all been subscribed. Stockholders took more than 94% of the issue of the Braden Copper Co., of $1,000,000 7% second mortgage convertible bonds at par. The issue was underwritten by Eugene Meyer, Jr., & Co. The convertible special contract bonds of the Proprietary Mines Company of America have been almost absorbed. The Proprietary company has been supplying the funds to build and equip the mill on the Tajo de Dolores property at Guanajuato. This, now practically completed, is said to be the model mill of the Mexican Republic. It is to begin operating in a few weeks.——The rehabilitation of the Granby has been commenced by the declaration of a 1% dividend. This is the first disbursement made since the slump following the publication of Otto Sussmann's report early in the year. Comparisons between the unexpected exhaustion of the Granby's ore reserves and the present plight of the Utah Consolidated are heard on all sides. Granby has over $1,000,000 on hand in cash and cash assets, while the present dividend will call for but $148,496. Granby's physical condition is much improved, exploration for new orebodies has proved satisfactory, while the work on the newly acquired Hidden Creek property is showing favorably. The present management claims copper costs have been reduced lower than at any previous time in the company's history.——The Guggenheim smelting plant at Baltimore is about to lose the handling of 20,000,000 lb. of copper annually, coming from the Mt. Lyell in Australia. The firm of L. Vogelstein & Co., of New York, is interested jointly with the Mt. Lyell and Mt. Morgan Co. in the Electrolytic Refining Co., Ltd. The recently completed plant will go into operation in a few weeks, and the refinery output will be sold by the Vogelstein people. Mt. Lyell produces about 18,000,000 to 20,000,000 lb. of copper annually, the precious metal content from the same ores running about 650,000 oz. silver and 13,000 oz. gold.——An examination of the Ray Central property is to be made by W. H. Weed and F. H. Probert. The bond issue of the Ray Central has been seeking an underwriting, so far without success. The company's representatives claim some 10,000,000 tons of commercial ore proved.——It is said that the Red Metals company will be dissolved during the coming year. The entire capital stock of the company is held by the Butte Coalition Mining Co., the direct title to the Butte Coalition ground being formerly vested in the Red Metals. When the Anaconda merger was completed this title was transferred to the Anaconda and now the only asset of the Red Metals is the 500,000 shares of Anaconda received in exchange for the Butte Coalition property.

A. N. Treadgold, who has organized a dredging and power company at Dawson to operate gold dredges in the Klondike district, has had a force of 300 men in his employ part of the past season digging ditches, erecting a power plant, and putting up a pole-line for the transmission of electric power.

General Mining News

ALASKA

The report of the Alaska Treadwell Gold Mining Co. for the month ended November 15 is as follows: Mill time, 31 days. The 240-stamp mill ran 30 days 12 hr. 15 min. Water power 18 days, 22 hr. 29 min.; steam power 11 days, 13 hr. 49 min. Ore crushed, 34,072 tons; concentrate saved, 658 tons. The 200-stamp mill water power ran 26 days, 10 hr. 57 min. Ore crushed 43,904 tons; concentrate saved 760 tons. Total ore crushed, 77,976 tons; total concentrate 1418 tons. Estimated gross value of free gold, $111,292.80; estimated gross value of concentrate $75,465.05. Total $187,457.94, less $486.85 for 130 tons of ore of United company, $186,971.09. Total realizable value, $180,267.08. Operating expenses, $94,028.86; net operating profit, $86,248.22; construction expense, $18,518.77. Yield per ton of ore milled, $2.37; stock of broken ore 33,898 tons. Development, 417 ft. in ore, 150 ft. in waste; assay value of ore, $1 to $8.21.——Reports by men who came out of Iditarod in November are to the effect that the prices of provisions there are high, that a team of horses commanded $5 per hour, that a first-class dog for the trail brought $100. Much travel is reported between Iditarod and points on the Kuskokwim.

ARIZONA

COCONINO COUNTY

The Grand Gulch M. Co., for which W. P. Jennings of Salt Lake is manager, has shipped three cars of ore to Salt Lake valley smelters, the gross proceeds of which were about $10,000. One car sampled 4.3 oz. silver, 36.1% copper, and 5% iron. The mine is situated on the north side of Colorado canyon, and 70 miles from the nearest station on the San Pedro railroad.

GILA COUNTY

(Special Correspondence.)—The Live Oak company has started No. 39 churn drill hole 500 ft. south and 500 ft.

Map of Arizona.

west of the vertical shaft, and No. 40 at a point 100 ft. east and 500 south. This is the shaft at which development on this property was first started. Hole No. 34, in which ore was found at 460 ft., is now down 655 ft. and is still in ore, making 195 ft. of ore averaging 2½% copper. The continuity of the orebody at this depth in this, the most southern hole sunk on the property, would indicate that the sulphide zone is of greater extent than was anticipated, and this fact results in enhancing the value of

the property. Drilling continues in holes No. 35, 36, 37, and 38. The progress in drilling No. 36 is slow, the formation here being leached schist. Its location is on the west end of the property, near the boundary of the Montezuma group. The Warrior mine continues to produce 100 tons per day of ore sampling 10% copper, which is shipped to the Old Dominion smelter. The ore consists of chrysocolla, of which this mine has proved so productive in the past. Exploration work with a churn-drill is to be started soon, with the possibility of finding the system of fissures through which the present orebody may have been deposited.

Globe, December 10.

(Special Correspondence.)—The Summit company, which purchased the Gibson claims several months ago, continues development work. The vertical shaft, sinking of which was resumed some time ago, has reached the depth of 700 ft., which is 100 ft. lower than the old workings. After cutting a station, driving will be commenced and a level established at this depth. The cross-cut, which is being driven on the 400 ft. level, has cut through the Pasquale vein, in which there is about 5 ft. of high-grade ore. This is the same vein of chalcopyrite that was discovered on the 300 ft. level from the inclined shaft. The sample mill, on which work has been progressing during the past month, is nearly complete and will be in operation within a week. Charles Myers is superintendent for the Summit company, and about 60 men are employed.

Miami, December 10.

The Old Dominion Copper Co. produced close to 2,800,000 lb. of copper in November, the average for the previous ten months of the year having been about 2,250,000 lb. per month. The mines of the United Globe, controlled by the Old Dominion, paid a floating debt of $100,000 and made a net earning of $75,000 since the first of the year. Its November and December earnings will accrue to the Old Dominion.

GRAHAM COUNTY

The November production of the mines of the Shannon Copper Co. was 1,420,000 lb. of copper, which exceeds the October output by 134,000 lb. The product for 11 months of the year amounted to 16,736,000 lb. of copper. The Shannon smelter and mill are at Clifton, the mines being situated in the vicinity of Metcalf, six miles from Clifton.

YAVAPAI COUNTY

(Special Correspondence.)—The United Verde Extension Co., operating at Jerome, is putting in a pump at the 800-ft. level, which is expected to handle the volume of water which comes into the sump at the rate of 1000 gallons per hour. J. J. Fisher is in charge.——The Snowflake, on Lynx creek, is being operated again under direction of John Harlan, who has a small force of men at work. A hoist and other machinery are being installed. This is said to be a promising gold mine.

Prescott, December 3.

CALIFORNIA

AMADOR COUNTY

The Amador Mines, Power & Water Co. has been organized at Jackson, the directors of which are W. H. Greenhalgh, R. S. Rainford, Geo. W. Brown, Richard Webb, and E. E. Endicott. The company contemplates the establishment of a storage reservoir in Grass valley, near Pine Grove, in this county, to cover an area of 150 acres; and the erection of a hydro-electric plant on Sutter creek, five miles from Jackson, to have the capacity of 2000 hp., at least half of which is expected to be used by the mining companies of this locality.

INYO COUNTY

The Casa Diablo Gold M. Co. is operating a mine and mill, situated 2½ miles from Owens river, and a short distance from Laws. According to a recent report, the mine is at an elevation 4000 ft. higher than Laws station. In a granite country. The development has been by means of one principal adit, which intersects six veins within a distance of 540 ft. These veins are well defined, but vary greatly in width. The ore is gold bearing, assaying from $4 to $40 per ton. The amount of stoping ground above the adit level varies from 50 to 400 ft. on the various veins. On one vein a 315-ft. shaft has been sunk to develop ore below the adit, two drifts having been driven in ore from the shaft. A. L. Carter, who sampled the mine, estimates 58,800 tons of ore exposed and available for milling. The equipment includes a 10-stamp mill which crushes an average of 33 tons per day. It is now planned to increase the mill capacity to 56 tons per day, by changing the stamp-drop from 88 to 95 per min., using coarser screens, and regrinding in a tube-mill, then cyaniding the product of the latter in agitating tanks. The proposed change will require a filter-press. The company has its own hydro-electric power plant on Owens river.

FRESNO COUNTY

The Davis Flat mine has been undergoing development several months. A 5-stamp mill was started last week on a supply of ore already mined. There is said to be 600 tons of ore on the dump running $10 to $12 per ton, and ore being taken from the 72-ft. shaft assays $40 to $120 per ton. The vein averages about 2 ft. in width. The property is out from Selma.

PLACER COUNTY

Peter Dick, P. J. Hurley, Henry Esmond, and others, residents of Minneapolis, have instituted foreclosure proceedings again W. J. Jean and the St. Anthony Mining & Manufacturing Co. to recover the amount of a mortgage for $4500, and they also ask that a receiver be appointed for the company. The property is in the vicinity of Auburn.

SHASTA COUNTY

The Gladstone mine, of which I. O. Jillson is superintendent, is operating with a force of 100 men. The shaft has a depth of 1700 ft., which is 700 ft. lower than the main working adit, or mill level.——The American mine, on French gulch, under option to Mr. Peale and associates, is being provided with a steam-hoist to facilitate sinking deeper.

SIERRA COUNTY

The Tightner lode at Alleghany is reported having a proved length of 260 ft., as shown by the lower adit, and has 600 ft. of stoping ground. In addition to a milling grade of gold-bearing quartz, there are found small pockets of ore containing from 2 to 100 oz. gold. The Red Star and Croesus, in the same district, are each mining rich ore. Three shipments of concentrate were made by the Croesus management during the last three months, besides the product recovered on the plates.

SISKIYOU COUNTY

The Homestake mine, situated on Taylor creek, near Yreka, has been sold by the Pluto M. Co. to R. S. Taylor at $30,000 cash. The property is in the neighborhood of the Highland mine, which was sold to The Hague syndicate last month for $250,000. Mr. Taylor's intention is to equip the mine and have it ready to begin operating next spring.

TUOLUMNE COUNTY

(Special Correspondence.)—The six claims known as the Densmore group, near Parrot's Ferry, have been bonded to William Brenner, who has commenced work with a small force of men. The property is owned and was operated for some time by the Densmore Con. Gold M. Co., composed of local people, and some shoots were opened containing high-grade ore in places.——Conlin Bros. have resumed work in the long cross-cut at the Experimental Gulch mine, above Columbia. The adit is to be 1000 ft. long and is expected to tap the vein at great depth, the objective point now being less than 300 ft. ahead.——Work will soon be resumed at the Slap Jack mine, near Groveland, after an idleness of several years caused by litigation.——It has been decided to suspend work at the Mariana copper mine, near Chinese, until next spring, when development will be resumed on a more practical plan.——

A 2-stamp mill and hoist are to be installed at the Indian mine near Fowler in the Jupiter district. An adit is being driven in which is a 4-ft. vein of good grade ore.——It is reported that a company of San Francisco people have a bond on the Steel group of mines in the Knight's Creek district. The property is developed by a 140-ft. shaft from which some drifting has been done.——Forty of the 100 stamps at the Shawmut mill are again in operation.——The new mill at the Tarantula mine is expected to be ready to operate within two weeks. Two 500-gal. galvanized iron tanks are being made for the property.——The Marie Patricia and Sanford mines have been sold at referee's sale. M. F. Sanford, one of the owners, having obtained a judgment against J. D. Barber and W. H. and Sarah E. Remington. The property was purchased by the latter for $2034.14.——A shoot of rich ore is being opened in the Basin Chief mine owned by John Daves and associates. A 6-in. streak was found containing free gold.——The Little Beauty and Hand Over mines, near Arastraville, have been bonded to M. Tucker, a local mining man, and work has been started at the first named claim. An adit is being driven that will tap the orebody at 100 ft. depth. The shaft on the Hand Over will be sunk 100 ft. deeper, and drifts are to be run into the 245-ft. shoot, from which ore assaying $25 to $100 per ton was taken near the surface. The vein is 18 in. wide.

Tuolumne, December 11.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.)—A rich discovery was made last week in level No. 2 of the Josephine mine in West Argentine district. At a distance of 200 ft. from the portal 10 in. of galena is showing that brings a mill settlement of $64 per ton in silver and lead.——M. O'Hagan & Co., leasing on the Seven-Thirty mine through the Hercules level, has uncovered 10 in. of ore assaying 28% zinc and 30 oz. silver per ton. In the bottom of the winze 6 in. of ore is exposed that mills 150 oz. silver, and 30% in lead.——The Converty lease in the Capital mine has one of the richest discoveries made in recent years. Work is going on through stope No. 7 on the 190-ft. level, where there is 14 in. of solid ore that samples 6.48 oz. gold, 2.3 oz. silver, 68% lead, and 5.50% copper per ton. Heavy shipments are being made.——A. L. Stephens, of the Mendota Mines Co., states that a body of ore 23 in. wide has been opened at the junction of the Mendota and Tishomingo veins. Tests show from 125 to 150 oz. silver to the ton. Mining is in progress 170 ft. above the Victoria adit level.——The Rio M. Co., owning property on Sherman mountain, in close proximity to the Seven-Thirty mine, has commenced development.——The Vidler adit in East Argentine district has been advanced 4400 ft. from the eastern side of Argentine pass. The last 40 ft. was in vein material.——Lessees on the East Griffith mine have made arrangements to send a big tonnage of ore to W. E. Renshaw's Gem mill at Idaho Springs. Ericson & Co. sent out a shipment of 50 tons last week.——Work has been resumed on the Central Colorado, situated on Leavenworth mountain. E. J. Butts of Georgetown has taken those claims under bond and lease. Driving is in progress on the Central Colorado vein through the lower adit, and driving is to be started again on the upper adit.——O. W. Mann, manager of the Bellevue-Hudson property on Columbia mountain, has a force of men at work cleaning out the workings. Shipments of smelting and mill ore will be started in the next 30 days.——The Crown Prince Con. M. Co., owning a group of claims on Covode mountain, has commenced development, with F. Straub as manager.

Georgetown, December 10.

GILPIN COUNTY

(Special Correspondence.)—The Evergreen M. Co. is getting ready to begin extensive development. A new body of ore has been found at the 200-ft. level, and the shaft will be sunk another 100 ft.——The shaft on the St. Helena property has reached a depth of 40 ft., a 4-ft. vein of ore being exposed that runs $[illegible] per ton in gold and silver. Henry Baer is owner.——The Revelation adit has been driven 200 ft. and C. D. Barr, the owner, states that a 3-ft. vein of low-grade ore is exposed.——A company is being organized to develop the National group of claims situated on Pine creek. Work will be started soon to advance the adit, which is now in 200 feet.——A big body of medium-grade ore has been opened in the adit being driven on the Euclid vein. Tests show from $5 to $80 per ton in gold.——High-grade ore is in evidence on the 600-ft. level of the Eureka workings. The vein is 12 ft. wide, carrying ore running $5 to $10 per ton.

Central City, December 10.

LAKE COUNTY

The month of November in Leadville district was one of activity in mining and shipping ore. Within the month the Forest City, Modoc, Seneca, Modest Girl and Arastra, all situated on Carbonate hill, began shipping. The new shippers on Breece hill are the Bertha and Nevada; on Rock hill the Stevens shaft of the Iron Silver M. Co. began shipping. In the search for zinc carbonate ore the operators of the Nevada, Stevens and Forest City found excellent bodies of lead ore, in each case the lead shoot discovered having been previously unknown in that property. Thus the interest in zinc carbonates has served as the incentive by which comes a revival in lead mining. Doubtless there are a larger number of leases in force here than in any other district in the State, and there appears to be a good understanding between lessors and lessees. The zinc carbonate belt is believed to extend from Fryer hill to Weston pass, and it is this phase of mining that is attracting new attention to Leadville.

SAN JUAN COUNTY

R. W. Hollis succeeds W. W. Watson as manager for the Ledge Con. M. Co. The lessees at the Ledge mine are planning the installation of an air-compressor and sinking the shaft 300 ft. below present level No. 6. The mine is north of Silverton and has a 200-ton mill.——The mine of the Iowa Gold M. Co., in Silver Lake Basin, is operating under lease to the Iowa Tiger Lasing Co.——Lessees on the Silver Lake mine are tramming 40 tons of ore per day from the mine in Silver Lake basin to the mill on the Animas river.——Ludwig Vota, a lessee on the Gold Bug, shipped a lot of ore to the smelter at Salida, the net returns of which were $3900. It was not a large shipment, but it sampled 192 oz. gold, and 290 oz. silver per ton. The mine is in the vicinity of Silverton.——The Intersection, leased to D. J. Malchus, is operating at a profit. Development work is also being kept up, and the mill is being operated, the 83% saving being by amalgamation and concentration.

TELLER COUNTY

(Special Correspondence.)—The Mary McKinney mine, in Cripple Creek district, the principal workings of which

Intermediate Shaft, Cripple Creek Drainage Tunnel.

have been under lease for 18 months, is to be operated on company account after January 15. The water-level is sinking at the rate of 12 ft. per month as the result of the drainage through the Roosevelt adit. The shaft is

to be sunk 100 ft. deeper as rapidly as the water recedes, thus enabling the mine force to get at the ore almost as soon as the water is drained to that depth. The last dividend paid by the Mary McKinney M. Co. was on June 25, 1910, the amount of which was $13,092.52; total dividends to date amount to $894,363.

Anaconda, December 10.

(Special Correspondence.)—Water-level in the Portland mine has been lowered 2 ft. in the time since the watercourse was cut by the Roosevelt tunnel, and it is receding at the rate of three inches per 24 hours, although the No. 1 shaft of the Portland is two miles distant from the tunnel heading. The out-flow through the drainage adit is at the rate of 5000 gal. per minute. The high-grade ore produced by the Portland G. M. Co. is shipped to Colorado Springs and treated in the company's mill at that place, while the low-grade ore—that which runs from $2.50 to $3 per ton—is treated in its new plant at Victor. The latter is treating 8000 to 9000 tons per month, and the results of its operating have been so successful that the monthly capacity is being increased to 15,000 tons. To effect this increase a new 6-ft. Chilean mill, a set of rolls, and additional screens have been purchased, and these are to be in place and ready to operate by January 1. The milling costs at the Victor plant since July 1 have amounted to less than $2 per ton, and it is anticipated that this will be considerably reduced as the result of increasing the daily tonnage.

Victor, December 12.

The ore production of Cripple Creek mines for November, as reported by the mill managers and smelter agents, is given below, with estimates of the gross value of bullion extracted:

	Tons.	Value per ton.	Total.
Smelters	4,320	$65.00	$ 280,000
U. S. S. R. & R. Co.	15,010	22.00	330,220
Portland	10,000	20.00	200,000
Golden Cycle	24,550	20.00	491,000
Portland, Battle Mt.	8,750	3.50	30,625
Stratton's Ind.	8,000	3.00	24,000
Wild Horse	1,350	3.00	4,050
	71,980		$1,360,697

IDAHO

IDAHO COUNTY

The Del Rio M. Co. has commenced development on its group of claims on American river and Kirk's fork, near Elk City, with Peter A. Haines in charge.——A. W. Boyd, lessee of the American Eagle mine and mill, has organized a company, in which Walla Walla people have taken stock, for the purpose of operating more extensively.

LEMHI COUNTY

Butte mining men have purchased the twelve claims of the McDevitt group situated near Sunfield. The property is to be better equipped and developed. The former owners are John Rees, William Shoup, W. Gill, F. J. Cowen, F. Pattee, and W. B. Horn.——The Leadville mine, on the Junction contact, near Lemhi river, is a steady shipper of ore. The deepest workings are 200 ft. from the surface.

SHOSHONE COUNTY

The Marsh mine, situated at Burke, was purchased within the last year by a company controlled by O. L. Cowell of Missoula, J. A. White, and Pohlman Bros. of Spokane, at $150,000, the final payment of $35,000 having been made recently. During the last eight or ten months the property has been well developed under the direction of A. A. Booth. The Marsh is a lead-silver mine, having ore of shipping and milling grades.——The Shooneah group, on Coeur d'Alene divide, has been developed by 3000 ft. of work, the result of which is the opening of an ore-shoot 1000 ft. in length. It is said to be 75 ft. wide. The ore is composed of silver and lead carbonate, accompanied by tetrahedrite. ——The Missoula Copper Co., operating in the vicinity of Mullan, is reported having opened a 15-ft. vein of bornite in making a raise of 20 ft. from an adit level. It is estimated that there is 700 to 1000 ft. of stoping ground in the new vein above the place of discovery. It is the intention to raise and sink on the orebody from the adit. A force of 40 men is employed on the property.

NEVADA

CLARK COUNTY

The Quartette Mining Co., operating the Quartette mine and mill at Searchlight, treated 27,468 tons of ore for the year ended September 30. The mill-heads assayed $6.50 per ton, the bullion produced having amounted to $4.34 per ton, making the extraction 66.87%. The cost of milling was $1 per ton. The main shaft is being sunk below the twelfth station, the plan being to establish the thirteenth level at 150 ft. below the twelfth. Driving on the vein is in progress on the twelfth, the present heading being about

Quartette Mine, Searchlight, Nevada.

300 ft. from the shaft. A station for pumps has been cut on the eleventh, the pumps having been moved to this station from the seventh. The ore was found 400 ft. from the shaft on the eleventh level, and has been followed by driving over 250 ft. This orebody has a width varying from a mere stringer to 20 ft. On the tenth the driving has extended 1191 ft., and stopes have been carried from this level to the ninth. The sixth level has been extended nearly 400 ft. this year, giving it a total length of about 2100 ft. The property is a gold mine, the saving being effected by amalgamation, concentration, and cyanidation. At the end of the fiscal year the company was out of debt and had a balance of $85,000 available for development and exploration.

HUMBOLDT COUNTY

The Seven Troughs Coalition Mines Co. has opened a new ore-shoot in driving 400 ft. on the fifth level from the Kindergarten shaft. The pay-ore in the shoot is three feet wide, one sample taken assaying $118 per ton. The same orebody is to be opened on the fourth level. The mill is operating with three shifts, treating the ore produced on company account and that mined by lessees on the company's property.

LANDER COUNTY

(Special Correspondence.)—The Maricopa Mines Co. has its compressor in operation and will continue the True Blue adit until the Patriot-Chase lode is intersected. The adit will have a length of 4250 ft. and will connect with the Patriot incline at a depth of 1100 ft. A good tonnage of $12 ore is stored on the dumps, and equipment for a milling plant has been ordered from Denver. F. L. Judd is manager.——The Austin-Manhattan properties at Austin are being developed and it is expected to have the mill in operation soon.——At the Pittsburg-Red Top near Kimberly a shaft is being sunk to connect with the adit. Some good ore has been extracted in which gold and silver predominate. The property is controlled by Los Angeles people. J. O. Glover is superintendent.——The Hill Top has

a deposit of rich ore in the quartz, which occurs in small bunches. George Winifred has purchased three claims having water rights on the South Fork of the Humboldt river. His plans are to use the water for generation of power to operate the proposed reduction plant of the Buckhorn Mines Co. at Buckhorn. It is understood that a reservoir is to be formed by the construction of a dam 100 ft. high. It is rumored that the Southern Pacific contemplates building a branch line to Buckhorn. A custom mill is in course of construction at Copper Basin, about nine miles southwest of Battle Mountain, to have a capacity of 100 tons per day. It is expected to be in operation early next spring. The Rider Nevada Co.'s shaft discloses some copper carbonates. It is expected the sulphide bodies will be reached at 150 to 200 ft.

Austin, November 27.

The Austin Manhattan Con. M. Co. has built and put in operation a mill for dry concentration, which is reported doing satisfactory work. The ore is first reduced to the required fineness, then passed through a drier to eliminate the moisture. The mill is in charge of H. A. Smith, formerly at the concentrating and zinc separating plant of the United States S. R. & M. Co., at Midvale, Utah. The Maricopa Mines Co., whose operations are in charge of F. L. Judd, has purchased equipment in Denver for a mill to be built in New York canyon, four miles north of Austin. A crusher, rolls, tube mill, conveyor, and boiler and engine are to be installed. The plant is to have equipment for cyaniding. A force of 32 men is employed.

NYE COUNTY

(Special Correspondence.) The mill of the Nevada Reduction Co. has resumed operations and is treating 1200 tons from the Swander lease on the Earl.——The Shea-Putman lease on Manhattan Dexter is arranging for the immediate installation of a 50 hp. electric hoist, two 75 h.p. motors, two transformers, and other electrical equipment. The machinery is on the ground.—The Francisco lease on Stray Dog has a vein of quartz running $30 to $40 per ton of gold. It ranges from 6 in. to 2 ft. wide. A stringer of rich ore is also receiving attention.—The Canon mill, operating on ore from the properties of the Manhattan Milling & Leasing Co., has been provided with additional equipment and is now in a position to treat from 40 to 50 tons per day. The new equipment includes a Bryan regrinding mill, classifiers, and an elevator. At the mine developments have been increased in order to keep the plant operating at full capacity.—In driving on the Crasp lease on April Fool ground a two-foot body of shipping ore was opened. It is planned to send some of the rich stuff to a local mill soon.——The War Eagle has concluded a run on 400 tons of ore from the Big Four Leasing Co.'s lease on the Big Four mine. The ore averaged close to $100 per ton.——The McNeil mill on Union No. 4 has been completed and is expected to commence operating within a short time. Considerable ore is developed in the mine and sufficient is on the dumps to keep the plant operating for several weeks.

Manhattan, November 30.

The Montgomery-Shoshone mine, at Rhyolite, has been closed down on the recommendation of John G. Kitchen, general manager, who stated some time ago that the property was making no profits for 1910. This mine was sold by E. A. Montgomery a few years ago to Charles M. Schwab and associates. The ore proved of lower grade than was anticipated, and the investment has been disappointing from the first.

WHITE PINE COUNTY

(Special Correspondence.) For months past it has been rumored that the Cole-Ryan interests have purchased the Gunn-Thompson holdings of mines and water rights in this vicinity, which would seem to foreshadow the erection of a large smelting and concentrating plant for the Giroux company, which is finishing a fine equipment at the Giroux shaft. These reports have not been confirmed, but indirect details are coming to light every day. Thomas F. Cole, while here recently, stated to your correspondent that the Giroux company would positively erect its plant in this district and further that the time was not far distant when the undertaking would begin. He stated that there were some details to be worked out before definite plans were announced. Since these statements were made it would seem by reports that the Cole-Ryan interests are behind the merger which is now being effected at Pioche, whereby many of the mines of that famous camp are to be brought under one management. And as it is now generally believed that the Guggenheim dollar copper merger is about to be consummated it is apparent that the new smelter for the Ely district is to be one of the units of that giant enterprise which will stretch from the lakes to Mexico and as far west as Nevada. With the consolidation of the mines at Pioche under Cole-Ryan management it will naturally follow that a more direct railroad connection will be planned to connect the mines with the smelter at Ely, and it is also probable that the long talked of Salt Lake to Ely railroad will be included in the enterprise, and this would result ultimately in the construction of the Ely-Goldfield railroad which is backed by E. M. Smith and the Santa Fe railroad.—Recently this district was visited by John C. Greenway, general manager for the Calumet & Arizona and the Superior & Pittsburg mining companies of Arizona. His visit is supposed to have been in connection with the selection of a site for the proposed new plant for the Giroux company, but of this nothing has been given out, though it is known that the plant, when built, will be one of the largest and most complete in its details in the United States, and will treat lead and zinc, as well as copper, gold, and silver ores. The advent of what may be considered the Amalgamated people into the Nevada field as a competitor to the smelter trust is fraught with great interest. That their first big plant will be situated at Ely is regarded as reasonably certain, and doubtless some formal announcement to that effect will soon be made public.——The affairs of the Ely Central Copper Co. are becoming entangled in the meshes of the law. After the arrest of Scheftels and Rice, the promoters of the company, attachments were levied on the property. Finally local shareholders secured the appointment of a receiver. Attorneys for the company, which is still under the former officers, who are supposed to represent Rice, fought the appointment of a receiver, and after he was appointed they filed a suit for his removal, and also a suit asking for the removal of the attorneys representing the receiver. The court dismissed the case against the receiver, but sustained the action for the removal of the attorneys representing the receiver, on account of their having been retained for some time past by the Nevada Consolidated company, which has interests conflicting with those of the Ely Central company. The attorneys for the Ely Central company are fighting every move made by the receiver, which will prevent his accomplishing much for the company. In the meantime local stockholders have not been idle. They have an organization of which W. S. Holmquist is chairman, who has the proxy for several thousand shares of the stock. It is the purpose of the Ely stockholders to reorganize the company with assessable shares, and if possible to sell to the Nevada Consolidated company a piece of ground which controls the outlet to the Copper Pit. It is expected that this sale will net the Ely Central company from $100,000 to $150,000, which will be ample to pay off all of the company's debts and leave a considerable balance for operating expenses. Under the present plan of reorganization the company will also have several hundred thousand shares of stock which can be put on the market for development purposes. If these plans are adopted by the shareholders at a meeting soon to be held, there will yet be a hopeful future for the company, and the shareholders will not lose all of their investments as now seems probable through the pending litigation in the local courts.

The Nevada Consolidated company is arranging to use oil as fuel in one of its reverberatory furnaces, and if the experiment proves what is expected, it is probable that oil will soon take the place of coal in this district. The out-

put of the Nevada Consolidated has shown a steady falling off since July, which is in accord with curtailment of output by all of the larger companies. The company is mining on an average of 7000 tons per day, which could be increased to 10,000 tons should the occasion demand. New equipment in the way of dinkey engines and steel dump-cars are arriving, and the work of removing the overburden at Copper Pit is being rushed with vigor. The new Liberty Pit is also being rapidly opened, but will not be ready for production before next spring.

Ely, December 8.

UTAH

JUAB COUNTY

Pay-ore was discovered on the 800-ft. level of the Iron Blossom mine, Tintic district, by driving 200 ft. from the station. Bodies of ore of great width have been developed on the 400 and 500-ft. levels of this mine, and it is assumed that the ground between the 500 and 800-ft. levels will be explored with a reasonable prospect of finding profitable ore. The directors of the company, including Jesse Knight, W. L. Mangum, and J. W. Knight, are reported to be considering the advisability of building a concentrating plant. ——The Tintic Standard M. Co., manager for which is E. J. Raddatz, opened a pocket of ore on the 700-ft. level, assays running 50% lead, 17 oz. silver, and $1 in gold. The mineralization here is along a contact of limestone and porphyry. The lowest level is at 1000 ft., on which the miners are driving toward the contact. The property is situated in the north end of Tintic district.——Six cars of ore were shipped from the mine of the Chief Con. company last week, the returns from which are reported as having reached $100 per ton, gross. The mine is at Eureka.—— The Uncle Sam mine, Tintic camp, mined and marketed 30 cars of ore in November. The work is superintended by C. C. Griggs.

PIUTE COUNTY

Reuben DeWitt, operating as a lessee the Webster mine at Marysvale, has shipped two carloads of ore to a smelter in Salt Lake valley, the first one of which netted him $5100, and the second $4453. The second lot sampled 8.8 oz. gold and 57 oz. silver per ton.

SALT LAKE COUNTY

The American Exploration Co., managed by F. V. Bodfish of Salt Lake, besides taking control of the American Flag mine at Park City, has acquired oil land in San Juan county, on which it has an oil well called the Arcola which produces oil that resembles the Pennsylvania product.

SUMMIT COUNTY

The Virginia M. Co. has been organized to operate the mine of the C. C. Consolidated M. Co., in Thane canyon, near Park City, by E. P. Evans and associates. The new company has a 10-months lease on the property, and holds an option on 370,000 shares of the C. C. Con. M. Co. The mine is well developed, and the ores carry silver, lead, and copper. In one part of the mine is a large body of zinc ore. ——Tests for concentrating the slime are being made in the basement of the Daly-Judge mill. The ores of the Daly-Judge mine contain silver, lead, and zinc. As a rule much of the zinc ore may be mined separately, though all of the silver-lead ore contains some zinc. Experiments in concentrating the zinc ore are being made with the Mac-Quisten tubes, the work of which is the reverse of gravity concentration. The process is being demonstrated at the testing plant of the General Engineering Co., Salt Lake. An important event the past month in Park City was the completion of a drainage connection between the Daly West and Daly-Judge workings. The November production of the latter amounted to 4253 mine cars of milling ore and 480 mine cars of shipping ore.— The Snake Creek Tunnel Co., which is driving a drainage adit from the Wasatch county side of the range into the heart of the Park City district, drove 333 ft. in November, making a total distance of 2068 ft. When finished the tunnel's length will be over 14,000 feet.

Decisions Relating to Mining

Specially reported for the MINING AND SCIENTIFIC PRESS.

TITLE TO COAL OWNERSHIP OF SURFACE

The ownership and possession of the surface land does not carry with it the possession of coal underneath such surface, where the estate in the coal had been previously severed as to title. And the surface owner, in order to claim proper possession of coal severed in title from the surface land, must show that he has had actual physical possession of the coal, apart from his possesion of the surface, such as by operating mines.

Plant *v.* Humphries, (W. Va.) 66 Southeast. 94. Nov. '09.

ADVERSE MINING CLAIM IN PHILIPPINE ISLANDS

An adverse mining claim sufficient to defeat the right to a patent under the United States statute, where natives and their ancestors have held possession and worked such claims in the Philippine Islands for the statutory period, cannot be based on entry and staking of a claim and filing notice of location, where such possession was continuous to the time of bringing an action to restrain the persons relying upon such acts as amounting to an adverse claim from setting up title or interfering with the claims.

Reavis *v.* Fianza, 30 Sup. Ct. Rep. 1. Nov. '09.

PAYMENT BY MINING COMPANY FOR LABOR—EFFECT AS RATIFICATION

The payment by a mining company of certain claims for labor performed, on or in connection with its property, under employment of a third person, was held not to amount to an adoption or ratification, or even a recognition, of the claims of other laborers for services performed for such third person under similar circumstances and at the same time as the claims paid by such mining company, where the services had all been performed prior to such payment.

Linn *v.* Almeda Mining & Milling Co., (Idaho) 104 Pac. 668. Oct. '09.

INJURY TO MINER—CONTRIBUTORY NEGLIGENCE

A miner purchased from his employer a fuse with which to set off a charge of dynamite in his employer's mine. On being properly lighted the fuse failed to burn and smoke in the usual manner, and thereupon the miner supposing that it had gone out, frazzled the end of it and again applied the blaze, and on its failing to fuse again, repeated the operation, and thereupon an explosion immediately followed and the miner was injured. In an action by the miner for the injuries, it was held that his complaint was insufficient, as he was not warranted in assuming that the fuse was defective because it failed to smoke, and that he was guilty of contributory negligence in remaining so near after first lighting it.

Cody *v.* Norton Coal Co., (Va.) 66 Southeast. 33. Nov. '09.

MINING CLAIM—ABANDONMENT—SECOND LOCATION

Mineral ground covered by a valid location thereby becomes segregated from the public domain and is the property of the locator, and so long as he complies with the State and the United States laws and location regulations he has the exclusive right and enjoyment of all the surface included within the lines of the location; and during such time the ground so segregated is not open to location by another. However, grounds embraced in a mining location may become a part of the public domain, so as to be subject to another location before expiration of the statutory period for performing the annual labor, if at the time of making the subsequent location there had been an actual abandonment of the claim by the first locator; but at the time of such subsequent location, the ground must be open to location under the mineral laws of the United States.

Swanson v. Kettler, (Idaho) 105 Pac. 1059. Jan. '10.

Book Reviews

All of the books noticed in this column are for sale by or can be procured from the MINING AND SCIENTIFIC PRESS.

TRACK FORMULAS AND TABLES. By Shelby S. Roberts. Pp. 314. Ill. Index. John Wiley & Sons, New York. Chapman & Hall, London, 1910. Bound in black morocco flexible cover. Price $3.

This is a new volume in pocket size and clearly printed. It presents in a practical manner the track problems encountered daily by the engineer in his work on railroads. Curves, frogs and switches are treated in a concise manner and many new and useful suggestions are made to the young engineer and student. There are carefully compiled tables and formulas which make the book of practical value.

COMPRESSED AIR PLANT. By Robert Peele. Pp. 502. Index. Ill. John Wiley & Sons, New York. $3.50.

This is the second edition of Mr. Peele's noted work, revised and enlarged, having had 174 pages and 97 figures added to the original. It deals with the production, transmission, and use of compressed air, with particular reference to its application to mining. Several tables have been prepared of the detailed records of work performed by machine drills, which will be useful. There is also added 90 pages descriptive of various machine drills and their operation. It is a work which cannot fail to be of value to all users of compressed air at mines.

GUIA MINERA PARA INGENIEROS Y PRACTICOS. By Ferdinand McCann. Pp. 522. Index. Published by the author, City of Mexico, D. F. Price $6.

This volume is one of the most helpful publications in the Spanish language that has recently been issued. It is primarily intended for the use of engineers whose operations are being conducted in Mexico or other Spanish-speaking countries. It contains many handy conversion tables, including those employed in converting the metric system to English; tables of equivalents, measures, and weights, value of various metals in English and American money; assay tables, and many others found in engineering books in the English language, including circles, natural sines and cosines, logarithms, and trigonometric functions. A chapter on mining terms, and one on Mexican mining law, add much to the value of the volume. It is handsomely bound in flexible morocco cover.

PRACTICAL STAMP MILLING AND AMALGAMATION. By H. W. MacFarren. Pp. 166. Index. *Mining and Scientific Press*, San Francisco; *The Mining Magazine*, London, 1910. Price $2.

This book has evidently been written by a man who has been 'through the mill' in every sense of the word. The subject matter covers stamp-mill operation rather than stamp-mill construction, although much that is of interest and value to prospective mill buyers will be found within its pages. Every possible condition and emergency incident to the operation of stamp mills has been thoroughly covered, and the subject matter is clearly written in simple language, free from needless technicalities, making this book of exceptional value to young men desiring to qualify as mill operators or amalgamators. Even the old-time millman will find much of interest and value within its pages, and no one, whether he be a mining engineer of the highest attainments or an underground shoveler with ambitions to rise, should be without this book. Much has been written on the subject, but never before have the principles, theory, and practice of stamp milling and amalgamating free milling gold ores been so simply and clearly set forth. The book is divided into three parts: Part I, Stamp Mills; Part II, Amalgamation; and Part III, General Comments. The chapters on reports, milling tests, and related topics are particularly pertinent at this time when the old rule of thumb methods of mill operation are being rapidly succeeded by the most careful and accurate systems of sampling and accounting. The index is exceptionally good, and greatly facilitates ready reference to data on the problems of the moment.

C. J. H.

Recent Publications

PRODUCTION OF LIME AND SOLVENTS IN 1909. By J. S. Diller. U. S. Geol. Surv. Adv. Chap. Min. Res. Pp. 11. Washington, 1910.

THE TECHNICAL CONTROL OF THE CLAY-PRODUCTS MANUFACTURE. By Harrison E. Ashley. From Trans. Amer. Ceramic Soc., Vol. XII., Feb. 1910.

A CELLULAR REINFORCED CONCRETE DAM. By George J. Bancroft. From proceedings Colo. Sci. Soc. The author proposes a form of dam construction which is a departure from ordinary practice.

PETROLEUM AND NATURAL GAS. By A. G. Leonard, H. E. Gregory, C. W. Washburne, and Robert Anderson. U. S. Geol. Surv. Advance chapter from Contributions to Economic Geology, 1909. Part II, Mineral Fuels. Washington, 1910.

BIBLIOGRAPHY OF NORTH AMERICAN GEOLOGY FOR 1909, with subject index. By John M. Nickles. U. S. Geol. Surv. Bull. 444. Pp. 171. Washington, 1910. A concise list of books and other contributions having a bearing on North American geology.

COLORADO SCHOOL OF MINES MAGAZINE, October 1910. The Colo. S. of M. Alumni Assn., publishers. Golden, Colo. By F. W. Traphagen. Contains a description of the new ore dressing and metallurgical experiment plant of Colorado School of Mines.

MINING IN JAPAN, PAST AND PRESENT. Published by the Bureau of Mines, the Department of Agriculture and Commerce of Japan. Pp. 322. Ill. and maps. Tokio, 1909. An interesting exposition of the mineral industry of Japan, its history, development, and present condition.

GEOLOGY AND ORE DEPOSITS OF REPUBLIC MINING DISTRICT. By Joseph B. Umpleby. Geol. Surv. of Washington. Bull. No. 1. Pp. 65. Ill., maps, index. Seattle, Wash., 1910. Contains a comprehensive description of the geology, mineralogy, and mining operations in Republic district.

RESULTS OF TRIANGULATION AND PRIMARY TRAVERSE, for the years 1906, 1907, and 1908. R. B. Marshall, Chief Geographer. U. S. Geol. Surv. Bull. 440. Pp. 688. Index. Washington, D. C., 1910. The usual statement of progress of triangulation, which is the preliminary basis of the great Geologic Atlas of the United States.

GEOLOGY AND MINERAL RESOURCES OF THE SOLOMON AND CASADEPAGA QUADRANGLES, SEWARD PENINSULA, ALASKA. By Philip S. Smith. U. S. Geol. Surv. Bull. 433. Pp. 234. Ill., maps, index. Washington, 1910. An interesting description of the geology and mineral resources of a portion of the Seward Peninsula, including the veins and placer deposits, with a chapter on dredging.

THE AGENCY OF MANGANESE IN THE SUPERFICIAL ALTERATION AND SECONDARY ENRICHMENT OF GOLD DEPOSITS IN THE UNITED STATES. By William H. Emmons. Reprint from Trans. Amer. Inst. Min. Eng., 1910. Comprehensive discussion of the effect of manganese on the dissolution and reprecipitation of gold in veins, showing important bearings on problems of ore genesis and exploration.

GEOLOGY OF THE HALIBURTON AND BANCROFT AREAS, PROVINCE OF ONTARIO, CANADA. By Frank D. Adams and Alfred E. Barlow. Memoir No. 6, Canada Department of Mines. Pp. 419. Ill. Index. Ottawa, 1910. The region described in this interesting volume is entirely Archean, but the structure is complex. Many varieties of rock exist there, and metamorphism is pronounced, as it usually is in Archean areas. Much of the region has been reduced to a broad peneplain by the great ice sheet. Considerable space is given to a study of the petrology of the region and also to its economic resources.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

J. W. Finch is at Butte, Montana.

Bayliss S. Clark was in San Francisco.

O. Bergstrom was in San Francisco Tuesday.

Charles Janin has gone to Oroville and Folsom.

Ralph Arnold was in San Francisco Wednesday.

J. A. Burgess was in San Francisco Monday last.

C. W. Purington is at St. Petersburg temporarily.

F. Lynwood Garrison was in San Francisco this week.

A. F. Main has returned to El Oro, Mexico, from a trip abroad.

F. W. Bradley has returned to San Francisco from New York.

W. S. Noyes has returned to San Francisco from Shafter, Texas.

E. B. Kirby left San Francisco for St. Louis, Missouri, this week.

J. P. Hutchins sailed from New York for London, December 8.

Robert McCart, Jr., is general manager for the Indé Gold M. Co., Durango, Mexico.

Donald B. Gillies has returned to Santa Eulalia, Mexico, from a trip to the United States.

George A. Schroter is inspecting the properties of the Mines Company of America, in Mexico.

R. C. Kline is studying the ore of the Boulder Creek Co., of San Diego county to devise treatment plans.

Frederick G. Clapp has taken new offices in the Fitzsimmons building, 331 Fourth avenue, Pittsburg, Pennsylvania.

F. H. Probert returned to Los Angeles from the Superior & Boston mine at Globe, and left immediately for Ray, Arizona.

L. D. Goodhall has tendered his resignation as manager for the Needles Mining & Smelting Co., to take effect December 31.

I. L. Merrill, president of the Hedley Gold M. Co., recently inspected the properties of the company at Hedley, British Columbia.

C. M. Fassett, president of the C. M. Fassett Co., Spokane, assayers and metallurgists, was in San Francisco, on his way to the Orient.

Emil. Meizer, former manager at the North Pole mine and mill, Baker county, Oregon, has been visiting the Treadwell mines in Alaska.

L. C. Snider has been appointed assistant director of the Oklahoma Geological Survey, and Frank Buttrum has taken his place as chemist.

W. A. Stevens, of San Francisco, is developing a mining property near Hope, British Columbia, for the Steamboat Mountain Gold Mines Company.

A. H. Adams has resigned from the service of the Tonopah Extension M. Co., to become mill superintendent for the Geo. F. Roth M. Co., Neal, Idaho.

G. H. Carnahan, formerly manager for the Montezuma Lead Co., at Santa Barbara, Chihuahua, is in charge of the mining operations of the Mexican Metallurgical Co. at San Luis Potosi.

Thomas Neilson has entered into partnership with L. Morgan under the name of Morgan & Neilson, as assayers and analytical chemists, with an office at 319 South Spring street, Los Angeles.

D. A. McMillen, mining geologist, and consulting engineer for the Barney Copper Co. and the Globe Bureau of Mines, is on an extended trip to New York, Boston, and other Eastern points.

Market Reports

LOCAL METAL PRICES.

San Francisco, December 15.

Antimony	12—12¾c	Quicksilver (flask)	44½—45
Electrolytic Copper	14½—15¾c	Tin	41—42½c
Pig Lead	4.75—5.70c	Spelter	7—7¾c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50—9.75; large $7.50—8.50

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Dec. 8	12.60	4.50	5.78	54⅛
" 9	12.60	4.50	5.75	54⅛
" 10	12.60	4.50	5.73	54½
" 11	Sunday.	No market.		
" 12	12.55	4.50	5.68	54⅜
" 13	12.55	4.50	5.68	54⅜
" 14	12.55	4.50	5.65	54½

ANGLO-AMERICAN SHARES.

Cabled from London.

	Dec. 7. £ s. d.	Dec. 15. £ s. d.	
Camp Bird	1 10 0	1 11 4½	
El Oro	1 5 9	1 6 0	
Esperanza	1 17 9	1 17 6	
Dolores	1 5 0	1 5 0	
Oroville Dredging	0 6 0	0 6 9	
Mexico Mines	7 7 6	7 15 0	
Tomboy	0 18 2	0 15 7½	ex div.

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Dec. 15.		Closing prices, Dec. 15.
Adventure	$ 6½	Mohawk	$ 45½
Allouez	38	North Butte	29½
Atlantic	5½	Old Dominion	37
Calumet & Arizona	47	Osceola	125
Calumet & Hecla	540	Parrot	12
Centennial	16	Santa Fe	1⅜
Copper Range	67½	Shannon	11⅞
Daly West	3½	Superior & Pittsburg	13¾
Franklin	9¼	Tamarack	57
Granby	39	Trinity	4½
Greene Cananea, ctf	7	Utah Con	12¾
Isle-Royale	17	Victoria	2¼
La Salle	7	Winona	9
Mass Copper	7½	Wolverine	117

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Dec. 15.		Closing prices, Dec. 15
Amalgamated Copper	$ 63¾	Miami Copper	$ 19½
A. S. & R. Co	74¼	Mines Co. of America	5⅛
Braden Copper	4⅜	Montgomery-Shoshone	1/16
B. C. Copper Co	6⅝	Nevada Con	18⅛
Butte Coalition	19¼	Nevada Utah	⅞
Chino	21⅞	Nipissing	10⅞
Davis Daly	1⅝	Ohio Copper	1½
Dolores	5¼	Ray Central	2⅛
El Rayo	3⅝	Ray Con	19¼
Ely Central	1/16	South Utah	1¼
First National	1¾	Superior & Pittsburg	13⅞
Giroux	6⅞	Tenn. Copper	34½
Guanajuato Con	¾	Trinity	5
Inspiration	9¼	Tuolumne Copper	4⅞
Kerr Lake	6¼	United Copper	4½
La Rose	4½	Utah Copper	46¼
Mason Valley	9⅞	Yukon Gold	4

SOUTHERN NEVADA STOCKS.

San Francisco, December 15.

Atlanta	$ 13	Mayflower	$ 4
Belmont	4.55	Midway	18
Booth	8	Montana Tonopah	87
Columbia Mtn	3	Nevada Hills	2.30
Combination Fraction	19	Pittsburg Silver Peak	60
Fairview Eagle	35	Rawhide Coalition	5
Florence	1 40	Rawhide Queen	—
Goldfield Con	8.62	Round Mountain	37
Gold Kewenas	7	Silver Pick	7
Great Bend	2	St. Ives	15
Jim Butler	25	Tonopah Extension	1.00
Jumbo Extension	26	Tonopah of Nevada	8.25
MacNamara	19	West End	50

(By courtesy of San Francisco Stock Exchange.)

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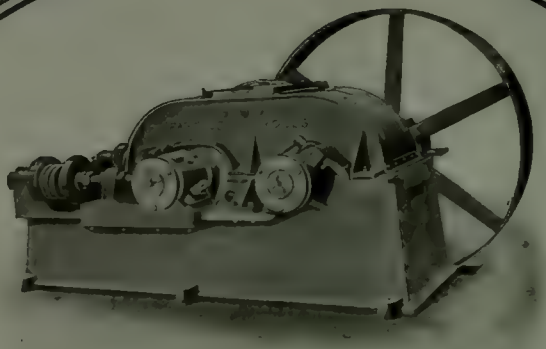

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EDITORIAL

WE join the attractive young lady on our front cover in wishing our readers a Merry Christmas. May the grade of your ore increase and your extraction never grow less!

ELECTRICITY is to be applied to drilling oil wells at Coalinga. In this, as in other work where a reciprocating motion is desired and where inequality of load is important, application of electricity has been slow. The great advantages incident to the ease of installation and distribution of power are slowly leading to changes. The work at Coalinga will be watched with much interest.

NEW copper production in 1911 seems certain to be large and many estimates are being made. In the *News Letter* circulated by Thompson, Towle & Company, Miami and Ray are credited with a possible 30,000,000 pounds, Chino with 15,000,000, and Utah Copper with an additional 20,000,000. This amount would not seriously disturb conditions, but others place the probable output higher. In the East it seems to be generally held that the California smelters will not overcome smoke difficulties in time to make large outputs next year; for our own part we have more faith in the ability of the men in charge to overcome even the admittedly great difficulties that now hamper production.

JAPAN and its mineral resources have been described recently in a most instructive handbook issued by the Bureau of Mines at Tokyo. We are indebted to Mr. Manji Yoshimura of that Bureau for a much appreciated copy, and we present this week a brief abstract from the chapter in which gold deposits are described. The mineral output of Japan now amounts to approximately $60,000,000 per annum, with coal, copper, and petroleum leading in production. The country is one of great interest, in that very ancient as well as most modern methods of mining and treatment may be seen in use. It is also one of large possibilities, and accurate information such as this handbook contains is welcome.

TESTS of many kinds are needed in order to develop and to improve engineering practice. In a recent paper on 'The Crushing Strength of Coal,' appearing in the *Proceedings* of the Sydney Engineering Society, Mr. Arthur Jarman, professor of mining engineering in University College, Auckland, New Zealand, has assembled and discussed existing data available for determining the proper size of pillars in coal mines. On the whole, it is apparent that the data are entirely inadequate. In general, such tests have been made on small pieces only, though in

Pennsylvania a few large cubes of anthracite, and in Illinois, similar blocks of bituminous coal, have been crushed. Even less data are available to engineers of metal mines. At Johannesburg some tests have been made, but in general the figures available are those obtained from studies of building stones. At the Pittsburg Station of the U. S. Bureau of Mines there is a 600,000-pound machine ready for use and a 10,000,000-pound machine that has never been erected. It would be extremely interesting to have the results of a really adequate series of tests made on these large machines.

AUSTRALIA is a country where effort to aid industry through Governmental action has gone to lengths that are frequently criticized. That there is much good, even if possibly some harm, in the friendly paternalism of the Australian States is indicated by the account of the mining situation in Western Australia written by Mr. A. Montgomery, the State Engineer, appearing on another page. It is also interesting to note that according to *The Australian Standard* the Federal Government has under consideration payment of bounties to stimulate production of oil from shale to safeguard the naval fuel supply. In the United States it has been hard enough to get the navy to adopt petroleum, despite its abundance, and a bounty is unthinkable.

Location and Annual Labor

On or about the first of January of each year prospectors and others throughout the mining regions of the West have long made it a practice to locate new mining claims, or to re-locate old ones. In view of this fact, a few suggestions will perhaps be timely, particularly to those not familiar with the laws governing the location of mining ground on the public domain.

The first requisite in the location of a mining claim is an actual discovery of valuable ore, or mineral, 'in place'—that is, not detached from the vein or mass in which it originally occurred. Having found the 'valuable mineral,' the next step is to post a 'notice of discovery' at the point where it was found. This notice should state clearly the length claimed along the lode, or vein, in each direction from the discovery point, and the width of ground claimed on each side of the centre line of the vein, which is supposed to run through the centre of the claim. The length of any one claim can not exceed 1500 feet, nor may its total width be greater than 600 feet, 300 on each side of the centre line. The locator should state in his notice that he claims the statutory time within which to perfect his location. The next step is to mark carefully the corners of the claim by stakes, or monuments of stone, or both, so that the boundaries may be easily traced. Often the prospector, or claim locator, purposely neglects properly to define the boundaries of his claim, seeming to think obscurity as to the definite limitations will serve some useful purpose. No greater mistake can be made. It is quite likely that if the claim is of no value, and no very valuable ore is discovered, the locator will remain unmolested in his possession till doomsday; but let rich ore be found and attention is at once attracted. Then many become eager to oust the locator and take the claim. If the ground is to prove valuable, its discoverer can not too thoroughly safeguard his title by exact and painstaking compliance with the requirements of the law. Mark the boundaries clearly and substantially, not only by blazing trees, or building a little monument of stones, but by good-sized monuments and stakes, indicating each corner plainly. Having located the claim, begin work upon it at once and endeavor to do the equivalent of a year's assessment work; that is, one hundred dollars' worth. This is usually taken to be a ten-foot hole. The Federal law does not demand this, but in several States the laws do require a stated amount of labor within 60 to 90 days, this being required as a part of the act of location; and a wise law it is, since it prevents a certain class of men from staking scores of claims in new districts and holding large areas against all others while doing nothing to develop or improve the claims.

As to assessment work, all unpatented claims upon which the annual labor has not been performed in the year 1910, except such as have been located within that year, are open to re-location at midnight, December 31, 1910, by anyone except the original locator. The latter may go upon the ground at the last minute, so to speak, and by resuming work and continuing it until the hundred dollars' worth has been actually completed, save his claims from being appropriated or 'jumped' by others. This point in law has been passed upon by the courts of several States, and by the Supreme Court of the United States. For every claim taken, a separate discovery, on that claim, is necessary. A single discovery will not hold a group of claims. After discovery and location, a copy of the certificate of location should be placed on record, with the local recorder, if there be one, and also, for safety, with the recorder of the county in which the claim is situated. If there be no local recorder, then the notice should be filed with the county recorder. When annual labor has been completed, notice to that effect should be posted on the claim and a copy of this notice placed on record with the local and county recorders.

If it be discovered after making a location, that a mistake has been made, and that, for instance, the vein does not run in the direction at first supposed, but crosses a side-line, an amended location may be made, and the lines of the claim swung around so as to cover the vein properly; provided no one has located the ground adjoining the claim since the date of location. In that event the original locator will be unable to move the corners of his claim. That becomes his misfortune, but the law makes no provision for such shortsighted errors of judgment. Locate with the vein, laying the side-lines parallel with the outcrop, and by all means see that the end-lines are parallel so as to secure full extralateral rights.

The Clifton-Morenci District of Arizona—II

By Waldemar Lindgren

MINING METHODS

The three most important mining companies operating in the Clifton-Morenci district are, in order of their production: 1. the Arizona Copper Co. Ltd. of Clifton and Edinburgh, to which I shall refer as A. C.; 2. the Detroit Copper Mining Co. of Arizona, a Phelps Dodge concern, D. C.; 3. the Shannon Copper Co., Sh. C.

The A. C. operates near Metcalf three producing mines, besides several smaller properties and prospects. The large mines are the Metcalf, King, and Coronado. The King mine is on a fissure vein in porphyry. The ore is practically confined to the vein itself except where the Jamieson lode crosses it, where great disseminated orebodies have formed near the intersection. The Coronado is a fault-fissure in granite, with a diabase intrusion, and resembles the King, as mineralization is practically confined to the vein, and well defined walls separate the ore from the country-rock. The Metcalf mine resembles the Copper mountain type at Morenci—disseminated orebodies arranged in lodes—but the porphyry is somewhat more silicious, being consequently harder and less friable. The ground is not nearly as heavy as that in Copper mountain. P. B. Scottland, superintendent at Metcalf, has introduced stoping methods that are similar to those practised at Nacozari, though improved and adapted to meet local conditions. The change to modern working methods was rendered difficult, as the mines of Metcalf district had been worked in the old-fashioned way, lacking in system, and with little regard to the future. The use of steam-shovels was carefully considered, but the idea was abandoned for the reason that the orebodies were too badly cut up, the richest parts, and those which would have been most easy of access, having been mined, leaving the leaner parts and those covered with heavy overburden. Underground mining had been by either square-setting or open stoping. At present there are mainly two stoping methods, both practically dispensing with timbering and at the same time much safer than the old method of open stoping.

1. **Mining and filling.**—The orebody is worked in ascending slices, each about 20 ft. high. A slice is mined and the stope cleaned out. Then waste is run in from above and leveled off, leaving about 5 ft. open space between the back and the fill, enabling the men to attack the next slice. Raises and a haulage road are maintained by timbering. Some of the Metcalf hill orebodies are close to the surface and the waste mined for filling helps to strip the overburden from these upper orebodies, and thus permits mining this ore by open-cutting, that otherwise could not be stripped and mined in that way at a profit.

2. **Stoping on top of broken ore.**—The character of the Coronado and King veins, with their well defined walls, allows a simple method of mining. Stopes are cut out 40 to 50 ft. in height along the vein, sometimes two of these stopes, with a 10-ft. pillar between them, are worked as a unit. The ore is broken over the whole width of the vein, 30 to 40 ft. wide, and enough drawn or shoveled out to allow working space on top of the broken ore which is left in the stope. The men work on top of the broken ore. Drilling is done by machines almost exclusively, and all the holes are 'uppers.' After the stope has been started on the sill floor hammer machines of the Shaw or Waugh type, or others, do all the drilling, as practically all holes are 'uppers.' For block holing big boulders, the small hammer-machine patented by C. Holquist is used. This machine is only about 1½ ft. long over all, has a sort of saw handle, and uses perforated octagonal steel. In the handle is a spring valve that, if pressed, turns the air through the perforated steel, blowing out the drillings. The stope is started, either on the level and the ore shoveled out from lateral shovelways, or the bottom part of the stope is filled with waste 15 to 20 ft. high, chutes and haulage roads being first provided for by timbering, or the stope is started 20 ft. above the level and chute-raises carried up to it, preferably from a lateral haulage road outside of the vein. The distance between chutes, or shovelways, is about 25 ft., centre to centre. If the stope is carried up to an old waste-filled stope above, the latter is tapped after all ore is cleaned out of the stope beneath and waste is run in. The costs of these stoping methods I should estimate roughly to be between 30 and 35c. per ton of ore, delivered at the shaft, or at the ore-bin in case the ore is sent to the surface through an adit. For loading the ore into mine-cars at the shovelways, loading machines such as have been tried, though not with great success, in coal mining, might perhaps be applied successfully, as much of it is shoveled practically from the same place, the ore running to it by gravity. The disadvantage of the loader in coal mining was to a great extent due to the necessity of shifting the machine frequently, owing to the widely scattered broken coal, no large amount being readily obtainable at one place.

The mining methods employed in the Clifton-Morenci district are principally open-stoping, square-setting, and caving.

Open stoping is, and was, done both as surface open-cutting and underground open-stoping. It was apparently the chief method of working the metasomatic orebodies occurring in limestone and shale. Favored by a country-rock that stands well, these open stopes necessitated little timbering, and some of them are today open and in good condition, after years of abandonment. Surface open stopes are still worked to some extent at Shannon and Metcalf hills, and at the A. C. company's Queen mine, though it is idle at present. In these places the oxidized orebodies started practically at the surface, as was the case with the great Longfellow orebody, at Morenci, which attracted attention to the district. These surface orebodies are tapped by chute-raises

from adits. The broken ore descends through these. In the course of development these irregular little adits are more and more reduced to distinct levels. In places the open-cuts have descended to, or even passed, these levels. In the first case, the ore is shoveled into cars where it was broken, easily-shifted track with light steel rails being kept at all times close to the working breast. Elsewhere the surface workings are connected with the highest underground level, and the ore is drawn from the open-cuts through chutes down to it. The ore is broken with deep holes, sunk with jumper-drills, sprung with dynamite, and blasted with black powder. A great amount of ore has been mined for years from

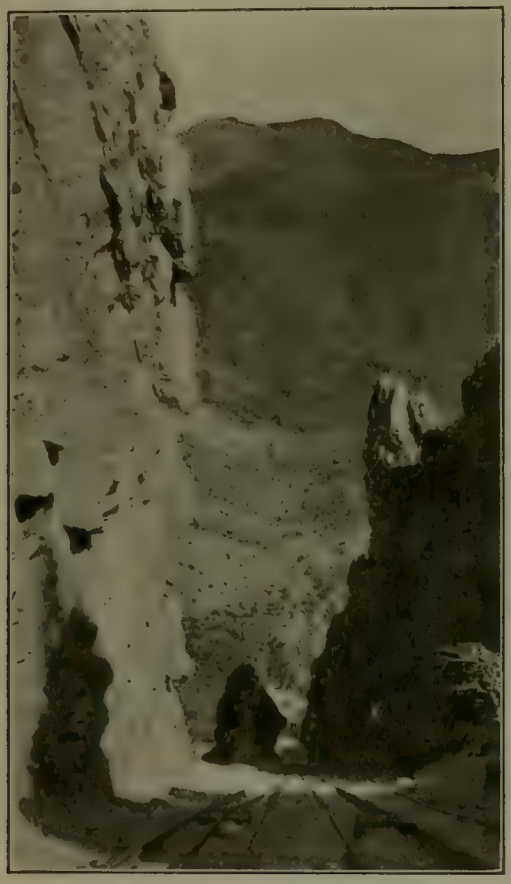


Fig. 1. Looking Down on Metcalf, Ariz., From Top of Coronado Incline.

these surface orebodies, and its further removal requires the stripping of an ever-increasing amount of overburden. This waste rock is either milled down into the mine and utilized as filling, or is disposed of in waste dumps on the surface. Shannon and Metcalf hills are honeycombed with these great open-cuts. Some of those which started as separate cuts have extended into each other, widening here and narrowing there, up to several hundred feet in length. These holes, and the accompanying waste dumps, have changed the original topography of the hills greatly. The surface open-cuts gave rise to an important feature of mining in the district. I refer to the surface-inclined tramways for handling ore by gravity. While the incline is very commonly used underground in coal mining in Europe, I never saw it developed to such an extent on the surface as has been done here. These inclines have either double track, or three rails, with a four-rail switch in the middle. The loaded car going down by gravity, pulls up the empty, or a car loaded with materials. Round, steel-wire ropes and cylindrical drums are used. The operation of the cars is controlled by brakes. The most prominent inclines are: the Coronado, 3200 ft. long on the incline and 1300 ft. high; the Shannon, the steepest in the district, being on a slope angle of 35°; and the Longfellow. The Longfellow incline handles the heaviest traffic. It is 2800 ft. long, with an average dip of about 17°. The upper 500 ft. is built on a steel trestle. The cargo handled, going down, includes the output of all the A. C.'s Morenci mines, except the Longfellow, as concentrate, first-class ore, or pyrite for the sulphuric-acid plants, and limestone and quartz ores for flux and converter lining, together with the limestone for the Shannon and A. C. smelters. The upgoing materials are, mine-timbers, machinery, and all merchandise for the A. C. Longfellow store. Coal used to constitute a great

Fig. 2. Caved Square-Set Stope, Arizona Copper Co., Morenci.

deal of the cargo till the A. C. changed its plant so as to burn oil.

Square-setting.—This method of timbering, while applied in some of the metasomatic orebodies, came into prominence with the opening of the porphyritic deposits. The Morenci square-set is the simplest of all in use here. The standard set consists of the following: (1) round post, 10 to 12 in. diam., 6 ft. 8 in. long over all, with horns 5½ in. square, 6 in. long on top, and 2 in. on the bottom; (2) cap (square), 8 in. by 8 in. section by 5 ft. 2½ in. long; (3) round girt, 5 ft. 2½ in. long, 10 in. diam., trimmed 1¼ by 1¼ in. on the sides at the ends to form a tenon 8 in. high. The details of timber framing for square-sets are shown in Fig. 3. Square-setting is employed as a rule in overhand stoping with subsequent filling, but has been tried also by the D. C. in heavy ground with underhand stoping. Large overhand stopes have been worked by this method, especially by the A. C., and while they were welcomed in earlier days, some of them must have proved rather expensive recently, as large areas of the country around the larger mines have begun to settle. This is increasing at an alarming rate in Copper mountain, around the Yankie and Longfellow mines, and will affect the town of Morenci as well as its mines. Some of the largest square-set stopes in the district

were laid out on the ... [illegible] ... Mine of the A. C. ... [illegible] ... mine in one stope the whole width of the ... lode at its widest part, ... [illegible] ... fault. The ground was laid out in alternating blocks each 7 sets wide. The length of the blocks to be mined was 60 odd sets, the width of lode. The intermediate blocks are to be mined down by caving after the original block stopes have been carried up to the waste line. Whether this will be a success remains to be seen. The conditions are ideal, if only the waste in the filled stopes can be kept from ... [illegible] ... entirely of the stope proper, as ... [illegible] ... cost ladderways can be ... [illegible] ... of the next block. This practice has been successfully followed wherever underhand square-setting has been resorted to. In underhand square setting the largest possible area of ground is kept open. The uppermost set is tightly floor lagged and carefully hand timbered as soon as the necessary working space permits. Several floors can be worked at the same time, as a new floor can be started as soon as a part of the upper one is completely filled, and it is advisable to keep the work well concentrated and not to start too many floors at the same time. Owing to the necessity of hand filling, floor lagging, and more difficult timbering, underhand stoping is more expensive than overhand work. The method is applied principally to heavy ground where the grade of ore warrants the

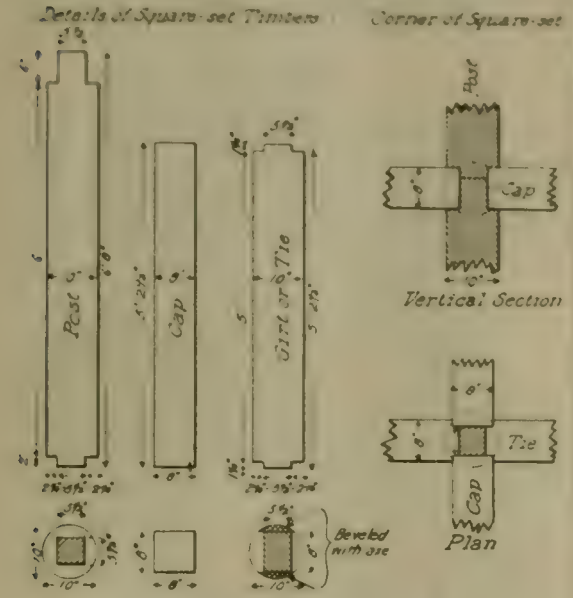


Fig. 3.

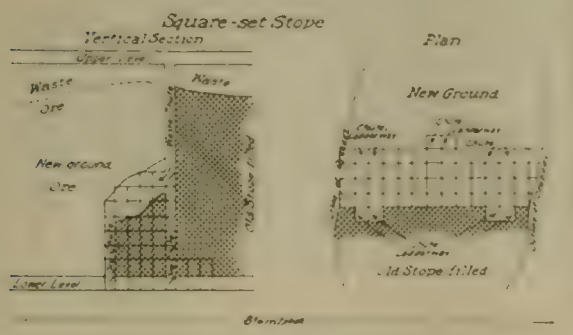
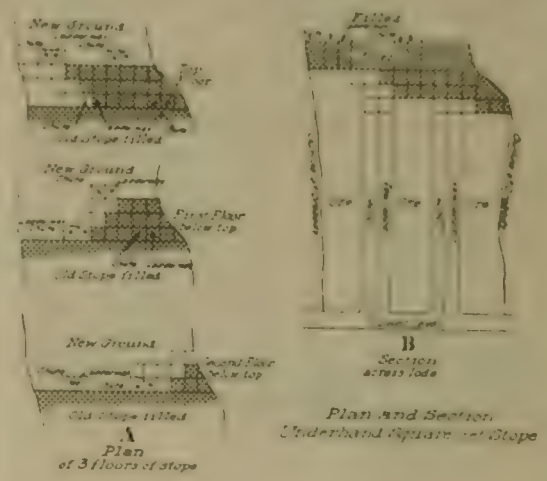


Fig. 4.



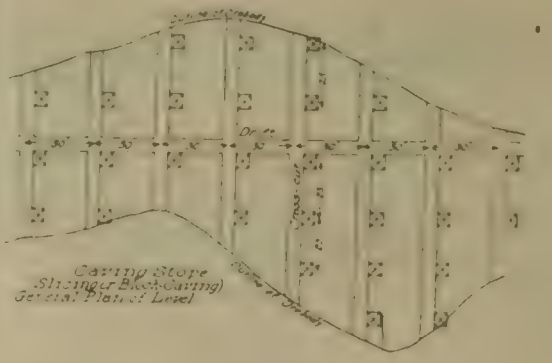


Fig. 5.

ning. This method of block-stoping is illustrated in Fig. 4.

The D. C. has within recent years changed its mining methods almost completely from square-setting to caving. Where ground has, of late, been square set, it has been mined in smaller sections. In heavy ground the stopes are laid out three sets wide, and in good ground five sets seem to be the limit of width, except in some early stopes. Where the lodes converge or widen the whole width of the lode is not taken out in one stope, but it is subdivided into blocks. It has proved practicable to place chutes and ladderways in the last row of sets at the side of the block and adjacent to the new ground, or even

additional expense. Waste for filling is mined in large surface pits at a cost of perhaps 5c. per ton of ore mined. Originally this cost must have been higher, as the cap-rock is about 150 ft. in thickness. These cuts have advanced so far downward that the A. C. is now mining some high-grade chalcocite in the waste pits which pays part of the cost of filling. The waste resulting from development and dead work is practically negligible in comparison with the tonnage of ore mined, most of the development being done in ore. The scheme of block-caving is illustrated by Fig. 5, which shows the general plan of the level, a vertical cross-section, B, and the plan of three floors, A.

The ore of the district is rather light, being chiefly a mixture of aluminum and magnesium, clay, and quartz with a slight admixture of pyrite and chalcocite, or oxidized copper minerals. The specific gravity will probably average near 3, or possibly less. Engineers figure that 12 to 13 cu. ft. in place, or 18 cu. ft. broken, equals 1 ton, or the content of one square-set approximates 20 tons.

Caving Methods.—The increasing heaviness of the ground, and the consequent greater difficulty and cost in carrying up square-set stopes, caused the D. C. to search for other methods of mining its ore-bodies. It was decided to adopt caving methods, as they have been developed in the iron mines in the Lake Superior region. The change was initiated during the time of high copper prices, so that the sudden slump which occurred later found the D. C. well prepared to meet this emergency. The methods employed at Morenci are those known as block-caving and slicing. P. B. Scottland, superintendent for the A. C. at Metcalf, has introduced other methods of stoping on lines somewhat similar to those in use at Nacozari, Mexico, and, favored by natural conditions, his mining cost is probably the cheapest in the district. Stoping in Morenci extends vertically, as a rule, through two, sometimes three (seldom more) levels. The standard distance between the floors of the levels is 100 ft., some of the older levels having less, and very few having more. When laying out caving stopes the stope-area is opened on the highest level by drifts and cross-cuts, and then raises are started at convenient intervals. It has been found that 30 ft. between cross-cuts and 25 ft. between raises, along these cross-cuts, measured centre to centre, affords ample shoveling facilities. The raises are carried to the top of the ore. For slicing stopes, the top of the ore is usually mined by square-setting, one or two sets high, and without filling. The floor is covered with lagging and old timber, the raises are secured by covering over and bulkheading. Then the timber is shot down, which gives a suitable wood-mat between ore and waste. As soon as the top floor has been shot down, slicing begins. The slices are taken about 10 ft. high (8 to 12 ft.). The work starts from one end of the stope and is carried backward. In the best practice small cross-cuts connecting the different raises are kept well ahead of the stoping. They are driven about 6 ft. high, leaving several feet of solid ground above. In stoping, the ore is taken out up to the mat of wood, which is held up by round stulls put in where required to secure the necessary working space. For these stulls rather thin, cheap timber is good enough. As the working face advances, or rather, retreats, the stulls are shot out, bringing down the mat with them, and new slices can then be started below. The top floor in the square-sets is not necessarily always at the same elevation, but conforms to the dip of the roof. The plan is to have at least one floor square-

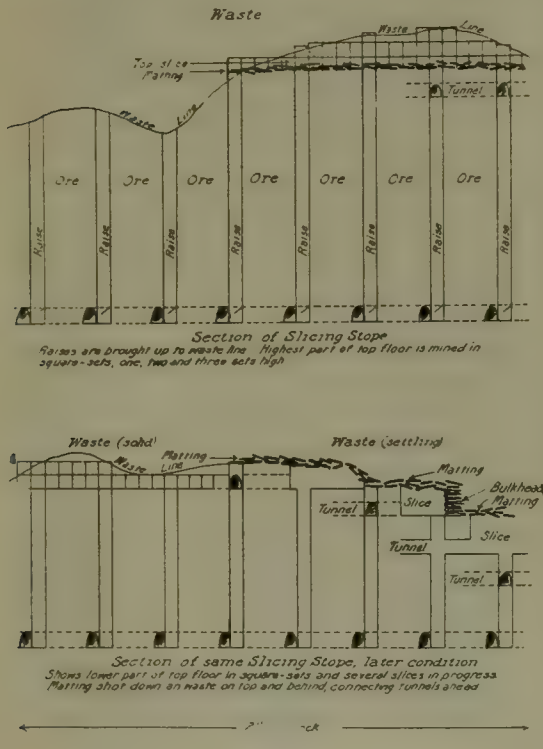

Waste
Waste Line
Top slice Planing
Tunnel
Ore
Raise
Section of Slicing Stope
Raises are brought up to waste line. Highest part of top floor is mined in square-sets, one, two and three sets high
Waste (solid)
Waste (settling)
Matting
Bulkhead Matting
Slice
Tunnel
Section of same Slicing Stope, later condition
Shows lower part of top floor in square-sets and several slices in progress. Matting shot down on waste on top and behind, connecting tunnels ahead

Fig. 6.

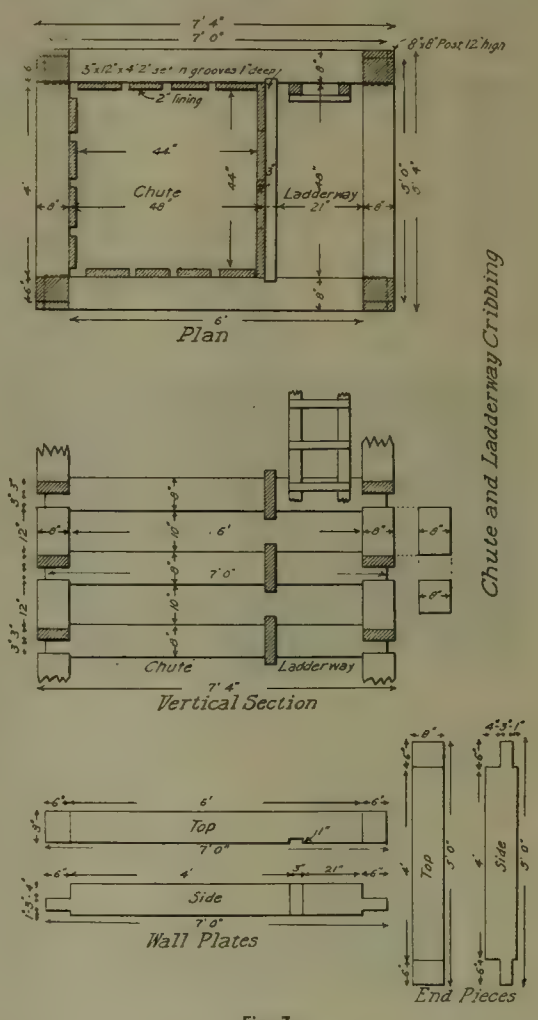
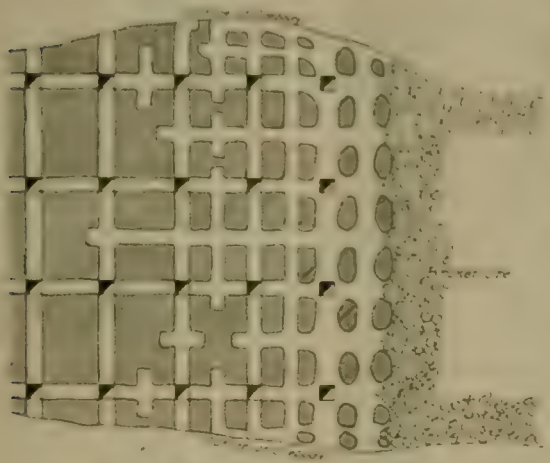
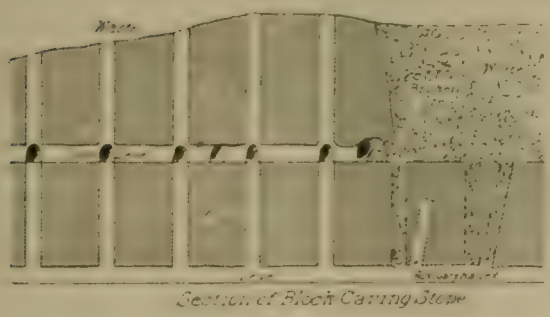


Fig. 7.

set all over the stope. Where the ore runs regularly in smaller areas the ground is followed up above the top floor, with square sets as far as locally there may be square sets 4 and 5 sets high. If the ore widens out laterally at a lower level, these wide places are gone first followed by square sets. For a whole new floors were laid on each successive sloping floor, placing 8 by 8-in. timbers 8 ft. long one way and 2 by 2-in. planks 10 ft. long across them. This gave an excellent floor easy to load by means of the stulls of the next slice below, and there was possible some economy in stulls but the greater cost increased materially and the system was abandoned for that previously described. Stulls should



Plan of Sub Level, Block-Caving Stope



Section of Block Caving Stope

Fig. 8.

lower sets for the footwall of about 8 by 8 in. posts 1 ft. long generally but up to 1 ft. 4 in. long on hard ground, resting the bottom 3 ft. 6 in. or 4 ft. 10 in. as the case may be. Details of these cross sets are shown in Fig. 7. The bottom sets are placed in square set fashion with 10 by 10-in. posts 9 ft. 6 in. high and 8 by 8-in. subs and caps. The chute front is also built of 8 by 8-in. timber. The chute doors are either of iron or of wood. The sprags are of the usual pattern made of 2-in. plank. The width of chute is about 2 ft. Immediately above the bottom set follows a similar short set 3 ft. high in the clear with round posts so that the chute floor can be moved up to this point in case the original chute becomes too low from settling when the stope 'takes weight.' The first cribset is laid directly on top of this short set.

Block-caving.—Block caving stopes are laid out in much the same way as shoving stopes, by drifts and cross-cuts on the level and raises to the top of the ore, but mining a top floor is unnecessary with square sets. While a square set top floor with tim-

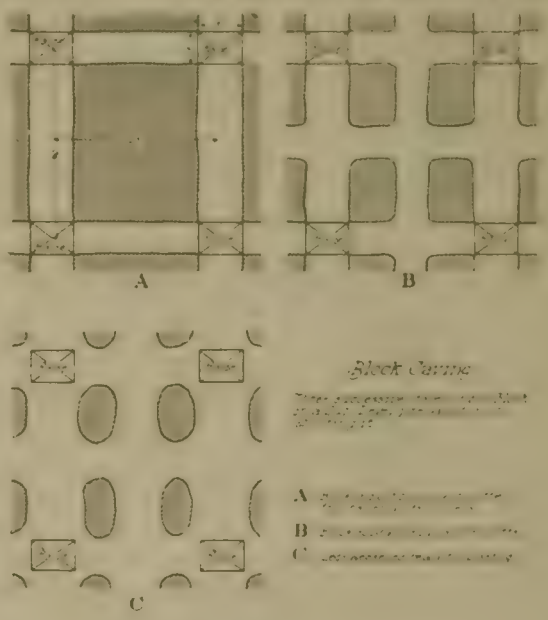


Fig. 9.

not be set vertically, but with a slight inclination of the upper end toward the worked-out part, as the settling mat will soon push them back into vertical position. Fig. 6 illustrates the methods here described.

Raises are brought up for chutes and manways, or for chutes only. The standard raise is cribbed with 8 by 8-in. timber, 5 by 5 ft. for chute; 5 by 7 ft. for chute and ladder. The partition between ladder-way and chute is made of 3 by 12-in. plank 4 ft. 2 in. long, inserted on both ends in grooves 1 in. deep. The chute is lined with 2-in. plank placed vertically and fitted tightly on the side next the ladder, with open spaces on the three other sides. Chute space, after lining, is 44 by 44 in.; ladder space, 21 by 48 in. The cribbing is framed with horns 6 in. long and 3 in. thick, having tenons 1 in. deep on the upper and

ber mat would temporarily afford a better separation between waste and ore, it soon is disarranged and the timber becomes a nuisance, blocking the chutes. It would not be necessary to push the raises to the top of the ore if the waste line could be established and maintained otherwise. If the raises are brought up to the waste, it is a good idea to strip them of timber before the actual caving begins. The operation is as follows. At a certain distance—20 to 35 ft. below the top of the ore—a working floor is started, called the 'sub,' or sub-level. The height of these sub-levels depends on the character of the ore. The easier and more regular the ore breaks, the higher are they taken. On them all raises are connected by drifts and cross-cuts, leaving blocks about 20 ft. square, in case of 5 by 7-ft. raises, 25 and 30 ft. between centres. These blocks are subdivided again

by other intermediate drifts and cross-cuts run parallel to the first series, leaving the block of ore standing on four legs. These are weakened by drilling and blasting as far as safety permits, and again drilled preparatory to the final blast, as are also the backs of all the drifts. This work is done with hammer-drills (Waugh, Shaw, and others). When a part of the stope has been prepared in this way the pillar and back holes are loaded and blasted electrically. The broken ore is shoveled into the chutes from that part of the stope still standing and drawn out below through the original chutes, and through others that are driven up to near the sub-level and then holed through into the broken mass of ore. The original raises are as a rule vertical and timbered. The secondary ones can be inclined, and if the ground is solid, may not require timbering. The ore is drawn out until mostly waste begins to show at the chute. Occasional blasting to break boulders will usually keep a chute going as long as needed. In principle, this method of stoping makes it possible to dispense entirely with timber, except in the original raises, where it can be recovered. In practice stulls will generally be found necessary here and there, but the less timber used, the better. Fig. 8 and 9 illustrate the method of working a block-caving stope.

Comparison Between the Different Methods.—Square-setting can be done under the best conditions prevailing at Morenci for about 80c. per ton of ore extracted, at least 20% of which would be for the timber alone; but unfavorable conditions, such as heavy ground, by necessitating reinforced timbering, careful filling, and small-sized stopes, make the cost run up to $2 and more per ton of ore. Slicing would cost, under favorable conditions, perhaps 60c. per ton. While requiring nearly the same amount of timber, it increases the tonnage mined per man and employs a greater proportion of common labor. Heavy ground will not affect its operation as readily as it does square-setting. One disadvantage is that first-class ore, from 6% copper up, used for direct smelting, can not be sorted out easily. An effort has been made to accumulate it in the stope and to run it out through one chute, set aside temporarily for this purpose, but the practice was abandoned. Leaving the leaner parts of the orebody, which can be done easily in square-setting, is also rather difficult and costly in slicing, as it breaks up the continuity of the mat and necessitates new square-setting below, should the orebody change again for the better. These difficulties make it necessary to mine the low-grade ore as well as the other. Block-caving can be done for about 40c. per ton. It gives the greatest tonnage per man and shift, and reduces the timber bill to almost nothing, but it is apt to result in mining large amounts of low-grade ore that would otherwise not be mined, and which, with the loss in concentrating, can not possibly pay expenses. Heavy ground affects this method but very little. Both slicing and block-caving represent a large initial expense, and take long preparation before a stope is ready for extraction, but after it is once started the production is more centralized and a very large tonnage can be rapidly mined from one stope by this method.

A careful sampling should follow closely the opening of a block of ground to be mined by the caving method, as mine samples as ordinarily taken prove usually to be higher than the ultimate mill sample covering the same block of ground, and in extraction, much of the profit of what should be won by cheap mining may be lost in taking too low a grade of ore. Sometimes more careful sampling might result in abandoning part of a stope already blocked out, as too low in grade to afford a profit, which otherwise might have been mined at a loss. To reap the full benefit of the cheaper working methods, improvements in mine sampling and concentrating are two important factors, and the Morenci companies, especially the D. C., have conducted researches in both branches for several years past. The floor plan of the stope on the different levels should be as simple as possible, and only enough drifts opened to afford the necessary facilities for tramming and starting the raises. The upkeep of the raises and tracks will run into a rather heavy repair bill in any event, and this should be kept to the lowest possible point consistent with the rapidity of working, and handling materials and ore. Morenci is somewhat handicapped in reaping the full benefit of the cheaper caving methods. In the first place, its orebodies lack the regularity and the even tenor of value of some other porphyry ore camps. Then, its orebodies are not intact, having been worked in their richer and more accessible parts by square-setting, and as a result, in places, there are some badly cut up pieces of ground which now remain to be worked by the new system. Last, but not least, mining in Morenci is not very speedy. The camp is somewhat conservative; hand-drilling is still the prevailing practice, machine-drills having been introduced only these last few years. More rapid mining would certainly reduce the cost, especially of slicing, and make possible the recovery of a good deal of timber that is now blasted and lost, at the same time that it would increase the tonnage output per man. The work is now frequently handicapped by the closing in of the mat due to settling and by the necessity of close stulling. New orebodies that afford the opportunity of close prospecting by boring present many advantages, as in these instances they might be mined by attacking the top by slicing, while raising and driving is going on below, thus minimizing the time required for keeping these workings open. Systematic boring, too, would give at the same time, a more reliable sampling than by any other method, even if it is liable to give a slightly higher average, as was pointed out recently by L. D. Ricketts at Cananea. Boring might also help to avoid losses in other ways. For example, at Morenci an orebody was prepared for block-caving, when another orebody was discovered in close proximity. By the time the second orebody was opened the ground of the entire vicinity was breaking and settling owing to the removal of the first. The drifts could not be kept open by reinforcing the timbers, even with use of angle braces or doubling. The raises were settling, and almost constant timber-changing and easing of ground had to be done.

United States Geological Survey

The fiscal year ended June 30, 1910, was one of great activity for the United States Geological Survey, as shown by the report of the Director, recently issued.

The first general report of this bureau directed particular attention to its [illegible] conservation lines. It was stated that the specific contributions of the Survey to conservation progress during the year were the completion through the regular channels of publication of the classification of the Alaska coal lands, the withdrawal of public coal lands in Montana, Wyoming, Utah, Arizona, and Alaska, and the withdrawal of public oil lands in California, Colorado, New Mexico, Utah, Wyoming, and Arizona. The total withdrawals at the close of the year were 4,647,121 acres. Great activity is shown in the withdrawal of lands recommended by the Survey in aid of proposed legislation touching the use and disposition of water power sites, the total of such lands withdrawn during the year amounted to 1,219,818 acres, thousands of Western power sites being affected. The total outstanding power site withdrawals at the close of the year were 1,161,120 acres. The need of a comprehensive oil land law is discussed in detail by the Director. At present oil lands can only be entered under terms of the gold placer law which is absurdly inadequate and tends to waste and even fraud.

The work of determining and classifying the phosphate deposits has been vigorously continued. As fast as discovered, public phosphate lands have been withdrawn from entry in the expectation of Federal legislation to remedy the defects in the existing conflicting mineral laws that are employed in acquiring these lands. The public land States contain large deposits of phosphate rock, probably the largest in the world, and it is believed sound policy to keep the phosphates for American farmers. There is no intention of hindering development for domestic use.

The Bureau of Mines having been organized July 1, 1910, the Director of the Geological Survey takes occasion to review the work of the technologic branch, at that date transferred to the new Bureau. This work began at the Louisiana Purchase Exposition with an appropriation of $30,000 for analyzing and testing the coals and lignites of the United States under the direction of the Geological Survey. Later appropriations for fuel testing added to this appropriation $1,357,000. This branch of the Survey also expended $412,500 for the investigation of structural materials and $300,000 for investigations of mine accidents. On July 1 the fuel-testing and mine-accident work was transferred by act of Congress to the new Bureau of Mines, the structural material work going to the Bureau of Standards.

In Alaska a large amount of regular topographic and geologic work with reference to deposits of gold, coal, copper, etc., was accomplished, and a special comprehensive plan was formulated for making subdivisional land surveys in the agricultural sections of the territory. The topographic branch includes a large portion of the field service of the Geological Survey. During the year 36,539 sq. mi. in the United States proper were topographically surveyed in detail. The Survey has its own engraving plant. It is the greatest map-engraving establishment in the United States. The total number of maps and miscellaneous printing delivered during the year was over a million and a third, nearly three and a half million printings being required, as many of the geologic maps are in eight to ten colors. It is noted that over 600,000 of the topographic and geologic maps were distributed to the public—about five-sixths of which were cash sales—as well as more than half a million reports.

Clay Cutout, Isabel Dredge

By W. B. Winston

The ground of the Isabel Dredging Co., at Jenny Lind, Calaveras county, California, contains probably more loam and clay than any other at present being successfully dredged. The relative amounts of gravel and loam under various conditions are shown

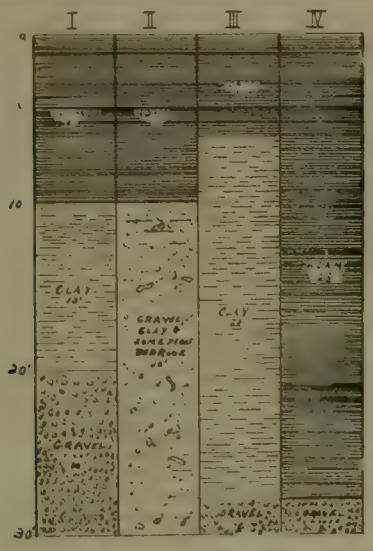


Fig. 1. Sections of Isabel Ground.

present. The worst conditions as regards operation, are illustrated in Fig. II and III. In the case illustrated in II, 10 ft. of loam and 20 ft. of gravel, clay, and float bedrock are present, and in III, 6 ft. of loam, 22 ft. of clay, and 2 ft. of tight gravel. The largest percentage of gold is found in the tight gravel under conditions I and III.

The Isabel dredge was originally equipped with side-flow tables and, in order to take care of the clay, with a combination revolving and shaking screen this last arrangement was not a success and the former management experienced much difficulty

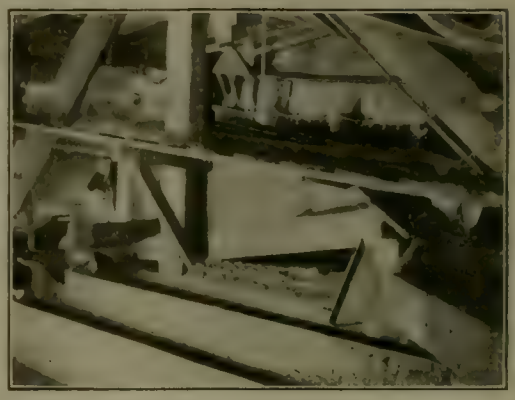


Fig. 3. Device for Enclosing Table Shown at B, and Clay Deflecting Plate at A, in Fig. 2. Part of Gold-Saving Tables in Foreground.

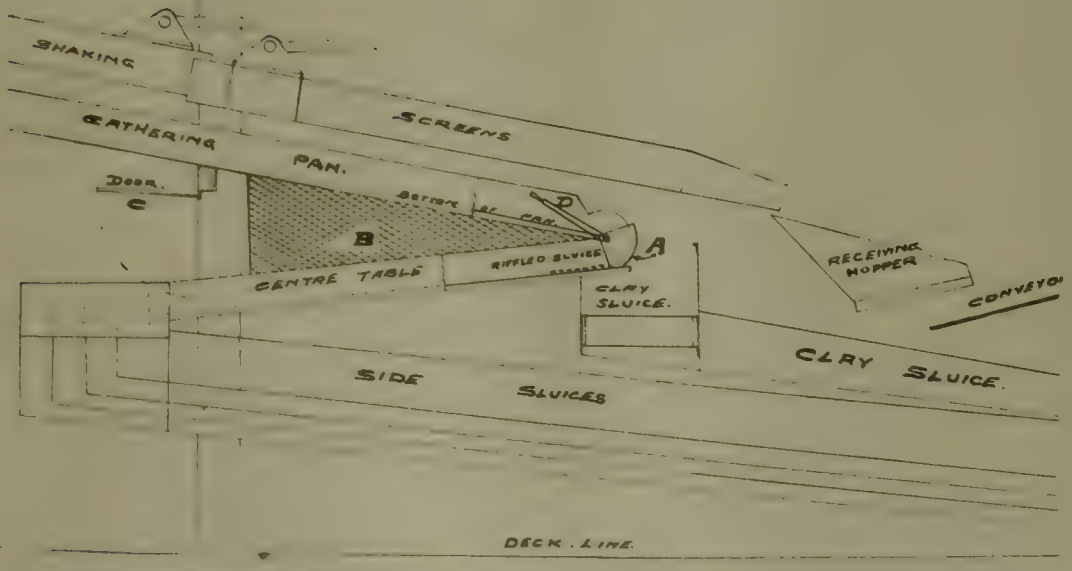


Fig. 2. Deflecting Plate for Cutting Out Clay. A, With Operating Handle. D; Screen for Enclosing Main Gold Table, B; Door for Locking Enclosed Table, C.

in the accompanying figure, I. Under average con- in handling the large amount of clay, which, being dition, I, the material contains 10 ft. of loam, 10 ft. sticky, is discharged with difficulty from buckets, of clay, and 10 ft. of tight gravel; least frequently, and while going over the gold-saving tables forms IV, 28 ft. of loam and 2 ft. of loose gravel are balls which are apt to rob the riffles and probably

did cause considerable loss of gold. When, after the reorganization of the company in 1907, the dredge was partly remodeled and strengthened, the old gold-saving tables were replaced by the longer Hodman-Hoopes type and a clay cutout or deflecting plate, designed by Fred J. Estep, present resident manager, placed at the lower end of the pan under shaking screens, as shown in Fig. 2. This deflecting plate V, which is pivoted and operated by a lever D, is raised while digging in loam or clay, thus causing all material passing through shaking screens

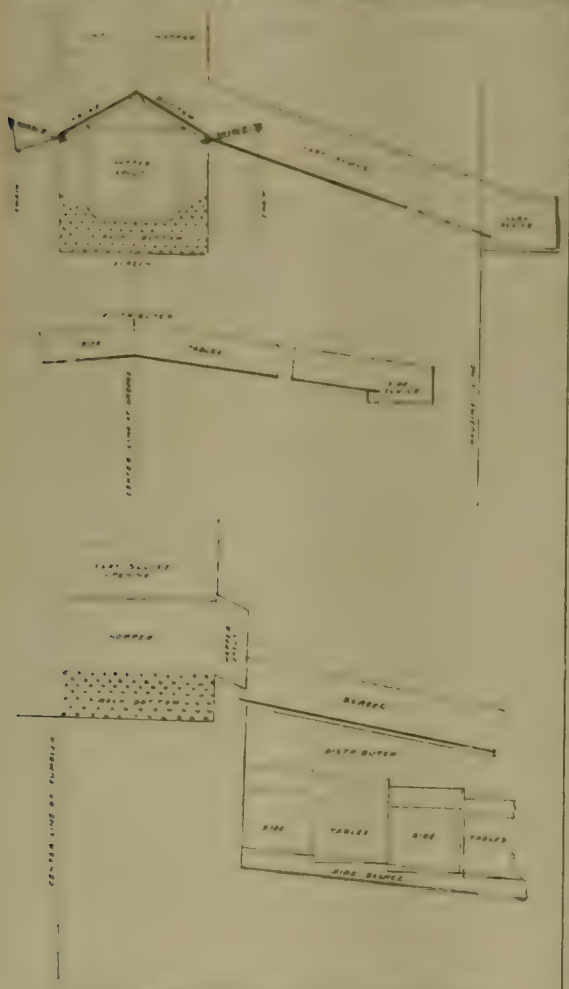


Fig. 4. Front and Side Views of Clay Cutout Device for Side-Flow Tables.

to flow into a separate sluice. The top of the clay sluice is directly under the deflecting-plate and runs over the gold tables on one side to end of the housing at the stern where it empties into a tail sluice which extends a considerable distance beyond the stern of dredge and the tail sluice from gold-saving tables. The large lumps of clay do not pass through the screens but are carried out over the stacker. While digging in gravel the deflecting-plate is let down in position, as shown in cut at A, thus causing all material from screens to pass over gold-tables as usual. This successful arrangement, together with properly arranged sprays in hopper, for loosening clay in buckets as they dump, has obviated practically all the delays and gold losses due to clay. At present the average amount handled per digging hour while in gravel is for conditions I, 110 for II, 130 and for conditions III, 60 cubic yards.

A practical and simple arrangement to insure against theft of amalgam from tables was also installed by Mr. Estep. It consists of a wire netting B and a door C which together keep the principal part of the gold-saving tables under lock and key.

An arrangement of a clay cutout for use in conjunction with side-flow tables is shown in Fig. 4. It consists of a false bottom placed above the hopper spout and made of two doors so arranged that by means of a lever and chain they can be raised and lowered in position, thus forming a false dump bottom while down, and doors for apertures leading to clay sluices while up. As in this arrangement none of the material would pass over the tailing stacker, the two sluiceways, which could be carried a considerable distance beyond the stern of dredge, would probably prove advantageous.

LODES WITHIN PLACERS

A placer claim for which a patent has been issued is presumed to contain no vein or lode of value, the patent being issued upon the sworn statement of the applicant for patent, that to the best of his knowledge and belief no such vein exists. However, "a failure to disclose known lodes in the application (for patent) will not make the patent cover them, nor prevent the issuance of a subsequent lode patent." (South Star Lode, 20 Land Decisions: Dept. Int. 204.) By the express provisions of the statute such failure must be construed as a conclusive declaration that the claimant of the placer claim has no right of possession of the vein or lode claim. Moreover, a placer applicant will not be allowed to amend his application, so as to embrace therein veins or lodes discovered by others after the location of the placer claim, but prior to the application for the placer patent. Where, after a placer patent has issued, another person wants to apply for a patent to a lode in the placer as a 'known lode,' he must first get a departmental inquiry to establish that the lode was known to exist at the date of application for placer patent. For the reason that 'known lodes' are reserved and excepted from placer patents, the lode claimant does not have to adverse the placer patent. It is only where the lode patent is applied for first that adverse proceedings are absolutely required.

The prospector must learn to discard prejudice. Never mind how things looked in the old camp, try everything in the new. The most unpromising rock may be rich in gold or silver. Give attention to all heavy substances, regardless of color. Tungsten minerals are black or white; lead may be white or stained with iron oxide or copper carbonate; copper ores present many hues; barite may be mistaken for scheelite (calcium tungstate); calcium borate (colemanite) may be thought to be calcite and vice versa; silver sulphide often looks like worthless manganese or iron ore; and tin (cassiterite) may be mistaken for any one of several far less valuable minerals.

Mining Outlook in Western Australia

By A. Montgomery

"I doubt if there is any place in the world which offers the man anxious to get a small mine of his own a better chance than Western Australia, for there is any amount of ground open for prospecting, and in most of the older districts there are facilities for crushing the ore within reasonable distance. Cartage is easy almost anywhere, without having to spend much money in making and clearing roads. Many men, therefore, have made a good living at working mines for themselves, and many have made fortunes, without ever approaching the market. A prominent instance recently is that of the Fenian mine at Meekatharra, owned by four men. It is opened to a depth of 625 ft., has its own battery, cyanide plant, and winding machinery, and when I left the State was putting up a new plant out of revenue. It has paid £77,000 in dividends, and the lucky owners were said to be getting dividends of £2000 per month. Few have been so successful as this, but many other working parties have done well. A great many are getting plants upon their mines and settling down to steady work, though often better organization and management than their own would make the mines far more profitable, the miners being often anything but good business men, and frequently indifferently skilled as miners. When a mine gets to the stage of being systematically worked with aid of machinery, it is probably best in the majority of cases that it should be handled under a skilled mining man. There is nothing in the common reproach that the people of Western Australia are themselves inactive in opening up their mines, but another objection which is constantly being brought forward as a reason why the British investor should pass Australia by and put his money into foreign countries, namely, that the conditions of tenure of mining property are onerous and unsatisfactory in the former, will bear examination. When instances and specific complaints are asked, it is soon found that the statement is based on misconceptions and misunderstandings of the true position made by people who do not understand—and often appear not to want to understand—the facts of the case. It would take far too long now to make a comparison of the terms offered to investors in mining properties by the various countries which are inviting the aid of British and European capital, but when the matter is closely examined, any unbiased investigator soon finds that there are few, if any, countries—personally, I have not been able to find any—which give terms more favorable to the investor than Western Australia. The whole tendency of recent legislation has been to make them still more so, it being well recognized by all responsible political parties in the State that outside capital is required for active development of mining, and that good terms must be offered to attract it. Most of the complaints which have come within my own official knowledge have come from persons who have been trying to secure concessions and advantages to which they were not entitled, and who in many cases have been trying to evade performance of the obligations into which they entered when they undertook to work the mines. Such people often make a great outcry and present a fair-seeming *ex parte* case, but their statements should not be accepted until the other side has been heard. In 1907 and 1908 an investigation of the mining laws of Australia and New Zealand was carried out by a special commissioner, A. C. Veatch, sent from the United States Geological Survey at the instance of Mr. Roosevelt, at that time President, and who speaks very highly of the mining laws of the Commonwealth, and is especially complimentary to those of Western Australia. He strongly favors the leasehold tenure obtaining there rather than the freehold of the United States, and concludes by saying: "In short, viewed from the standpoint of present-day knowledge, the Western Australian mining law has proved a decided success."

Many of the objections urged against the mining laws of Australia arise from confusion of ideas as to the principles adopted by various countries. A person accustomed to freehold tenure is apt to misunderstand the laws of another country wherein, as in Australia, only a lease of mineral ground is granted, and the fee-simple is reserved to the State. There is much to be said for both principles of tenure, each having its own advantages and disadvantages, but, from the point of view of practical mining business, there does not seem to be much to choose between them so long as a mine is in active operation. It is when a man wishes to hold ground locked up for speculative purposes, or sometimes for protection of previous expenditure, that the freehold becomes most desirable, but for all working purposes the matter usually, in practice, is one of indifference, there being rarely any difficulty under the leasehold system in obtaining all reasonable protection of any owners' interests. Objections are often raised to the powers left in the hands of the administrators of the mining laws to decide when concessions may be made to leaseholders in such matters as exemption from working their ground for a time, terms on which labor may be concentrated on one portion of a holding, and similar matters, it being complained that the investor is too much at the mercy of the Government of the day. There is little force in this argument. Most of the conditions governing such cases are, as far as possible, clearly prescribed by law, and, therefore, fixed and open to the knowledge of everybody, and where discretion is left to the administration, it is nearly always to meet the cases where special circumstances may require special treatment, and the decision cannot be made by rule. Such cases are inevitable, as in all other sorts of business. In dealing with people of one's own blood and language, a man can surely look for reasonable consideration of questions in which both sides are jointly interested, and just

"Abstract of paper read before the Colonial Section of the Royal Society of Arts, November 29, 1910.

treatment from local ores. Fears as to [illegible] democratic legislation are on much the same footing after all the people in the colonies are much like those in the parent country, with similar notions of fair dealing and justice, and no more to be feared than their relatives in the United Kingdom. As a matter of fact, no Government of any party in any Australian State has ever yet refused to consider reasonable representations of investors and to meet them in a reasonable spirit.

When trying to find out lately what it was that the London market had against Western Australia I was surprised to find that a great complaint was that the Government did nothing to encourage investors to go there, and was asked what we did to encourage any person to attempt to open mines in our State. In fact, a great deal has been done and is being done toward that end. First of all, exceptionally favorable terms are offered on which to acquire mining properties. British principles of law, justice, and procedure are followed in settling all disputes. If good propositions are offered, what more can anyone want than a fair chance of trying them, and a fair run for his money under the conditions which exist when he undertakes the venture? But the Western Australian Government is all the time improving these conditions, as far as it is able, by spending large sums annually in building railways, establishing mail and telegraph service, and other business facilities, providing water supplies, establishing State batteries, at which preliminary trials may be made, assisting in diamond-drilling, and even by direct monetary grants in some cases. The question is not what do they do to assist the investor, but what do they not do that is reasonable and feasible. The railway system comprised, to June 30, 1910, no less than 2145 miles of line, costing £11,384,000 for construction and equipment, and is being constantly extended. During 1907-8, 102 miles of new line were opened, the next year 101 miles, and last year 100 miles. Since last June the railway to Black Range has been opened, also one from Nannine to Meekatharra, and three others are expected to be opened before the end of June next. Others are projected, and on some of them work has been already begun, as in the case of the line from Port Hedland to Marble Bar, to open the Pilbara goldfield. These lately-undertaken railways are practically all for development purposes; they have not been built because it was profitable to do so, but in advance of settlement and development, in order to improve transportation so much that development could be greatly extended. Take, for example, the Port Hedland to Marble Bar railway. It would be idle to expect it to pay its way if the amount of work done in the district opened by it and the number of people in it were to remain as at present. But it is believed that the district is a good one and capable of great expansion of mining and population, if its present inaccessibility is overcome, and there has been little hesitation in authorizing the construction of the line once Parliament was convinced that this was the case. In the same way, agricultural railways are being run into nearly virgin country to promote settlement. Of course, it is essential that as far as possible such lines be made immediately productive to pay the cost of working expenses and at least part of the interest bill, and while the opening of business [illegible] it is clear that somewhat high rates of freight must have to be charged. From time to time they are reduced as it becomes practicable to do so.

So also with the water supply. The great pipeline 351 miles long which supplies the Kalgoorlie mines with water from near the coast has cost £4,236,242, and though working expenses amount to only about 1s. 6d. per 1000 gal., including the whole system interest and redemption bring the actual cost of the water sold last year to an average of 7s. 7d. per 1000 gal., and the full cost to the goldfields is estimated at 9s. 11½d. per 1000 gal. Water is sold to the mines at prices of from 4s. 9d. at Southern Cross to 8s. 6d. at Bulong per 1000 gal., where use is made of no other source of supply, the large mines at Kalgoorlie paying 7s. per 1000 gal., and a concession being made to poor mines by letting them have it at from 3s. 6d. to 5s. per 1000 gal. It is all very fine to grumble at the high rates of freight paid on some of the railways and the high cost of water, but surely the Government has conferred a great benefit in making these services available, even at these so-called high rates. They are far lower than those previously prevailing when there was no railway and no pipeline. Plainly, the Government has given immense assistance to mining by its railways and water-supply expenditure, and while these services are not yet making profits which would be considered commercially satisfactory, and are in many cases hardly, if at all, paying actual working expenses, it is somewhat ungrateful and ungracious to demand still further concessions from the Government.

Besides the Coolgardie water scheme, there is large Government expenditure in making and maintaining wells and tanks throughout the State, and all the main roadways are now fairly well provided with water. Boring parties are at once sent to every new field which promises at all well, to try to find fresh water and battery-water supplies. The cost of established water stations during 1908, including interest and redemption, was £19,879, and the revenue was £12,634. The assistance given by the Government to mining in undertaking the water supplies is of incalculable value.

The assistance given by the State battery system does not appeal so much to an investor in public companies as to the man who is trying to open a mine by his own work. To such they have been an inestimable boon, enabling them to pay their way out of the ore. During 1909 there were 35 batteries in operation, containing 294 stamps capable of crushing 300,000 tons of ore per annum, but, as they were not kept fully employed, only 94,218 tons were actually crushed. Most of these batteries have cyanide plants for leaching the tailing, and some have been equipped with slime-treatment plant as well. From the inception of the system to the end of 1909 the State batteries have cost £275,320, and have

Gold Deposits of Japan

History and Development.—Many localities where placer gold could be found have been known from early times, but the majority of the quartz gold mines which are in working order now were first exploited during the seventeenth century. Since 1890, ten large mines have been opened, among which the three famous mines of Formosa and the largest deposits of Hasune are included. From 1875, the first year for which detailed records are available in Japan, the production of gold increased gradually until 1889. In that year the production rapidly increased owing to the discoveries of the placer gold of Yesso in Hokkaido and the increase in the output from Formosa. During the five years, 1899 to 1903, the placer mining in Japan was the most prosperous, especially in the year 1901, when it reached the maximum, the placers yielding nearly 45% of the total production of gold. Since 1903 the output has not been so large, due principally to the sudden decline of the placer working though there was always a gradual steady increase of the quartz mine. According to the latest statistics the production of the placer mines is now only 4.8% of the total output of gold. The total gold output in 1908 amounted to 160,800 troy ounces, valued at $3,323,780, a little less than the value of the corresponding gold and securities lately shown among the mineral products of Japan. Now we pass upon the prevailing method of extraction of gold from the ore was amalgamation. In 1901 the process of cyanidation was introduced at Hosene mill in the Iwate ore at Yokote. The process took [illegible] process, still at present there are few mines which [illegible]. Although a number of mines [illegible] the quality of gold [illegible] production, increasing the [illegible] of gold.

Kind of Ores.—[illegible] occur chiefly in the native state, frequently mixed with pyrite, chalcopyrite, [illegible] and other gold ores. In rare cases it occurs as telluride. The principal gangue minerals [illegible] quartz, which [illegible] the matrix. In many cases [illegible] is [illegible] milling ore sometimes [illegible]. The gold ores are classified [illegible] their mode of occurrence [illegible] into [illegible] auriferous gold ore and auriferous silver ore.

Deposits and Geology.—[illegible] of the gold ores in Japan is as follows: [illegible] filling of fissures, [illegible] impregnation, [illegible] deposits, [illegible] deposits, [illegible]. Most of the gold is found in veins. There are two principal ranges, [illegible] ranges in the northern [illegible] and [illegible] ranges in the Tertiary [illegible] in the former [illegible] the [illegible] [illegible] [illegible]

are low grade. They are confined to the sedimentary rocks of the Archean and Paleozoic, existing as tabular and folded veins. In the other hand, in the Tertiary rocks veins are rather scarce, gold placers. From the point of view of the sedimentary and eruptive rocks of the Tertiary age. The greater number of the mines which are now working in Japan belong to this type. In the sedimentary mineralizers are connected with those of eruptive rocks. The gangue consists of the same kinds as those of the Archean and Paleozoic. Especially the Tertiary rocks, and sedimentary deposits. There are two types of impregnations, the mineralizers to be present and the impregnations in the Tertiary and Stock or Lenticular. The first class is chiefly found in sedimentary rocks of Tertiary age and works as gravel. These deposits seem to occur the upper portion of the impregnated parts of the rock, and were partly using the soft Wage pieces of feldspar and mica, so that when the granite is decomposed and becomes loose sand the gold bearing therein is easy to extract for an original mineral out of the rock. The granite of the environs of Tawaishi mine in Rikuchu is a typical example. The second type is connected with a large number of mines, especially in the dikes or bosses of Japanese. Owing to the highly acidic and siliceous character of the rock, the dikes themselves are frequently supposed to be large veins or masses of ore instead of impregnated rock. This type of deposit often accompanies copper. Deposits in Hokkaido and West coast in Rikuchu are the important mines of this type. The metasomatic deposits are formed usually just on or near the periphery of an eruptive rock, or even in the eruptive rock itself. The deposit is often associated with copper ore as in the case of impregnations. Kinkwaseki in Formosa is a typical mine. Contact-metamorphic deposits occur occasionally in the contact zone between Paleozoic limestone and some eruptive rock such as granite. Strictly speaking, these are auriferous copper or auriferous iron deposits. Ota in Nagato and Rokuroma in Rikuchu are the examples. Detrital deposits have been worked since early times in the river beds or in terraces in the districts of Kesen, Waikya, Hayakawa, Abekawa, Yoshinogawa, and elsewhere. Recently placers have begun to be worked in many localities in the Hokkaido and the river Kilung in Formosa. Up to the present time only the surface placers have received attention, and no gold dredging or underground working has been attempted. The largest nugget ever found in Japan weighed only 27.1 ounces, and was found in the gold-bearing gravel at Yesashi. The greater part of these deposits are in the Alluvium, while a few of them are discovered in the Diluvium. No Tertiary placers have been found. As a whole, the sedimentary and the eruptive rocks of the Tertiary age are the principal sources of gold in Japan. It is interesting to notice the fact that the greater part of this metal found in foreign countries comes, on the contrary, from quite a different source, namely, the rocks of the older formations.

Geographical Distribution.—Although gold is widely distributed, in small quantities, yet the chief gold producing regions are confined to [illegible] and are found in the outer [illegible] regions. In the northern portion of Honshu (Japan proper), the mines of Kyushu (especially in the northern part of the island) and of the central portion of the northern one-half of Hokkaido (including the island of Sado in Honshu). There are three famous mines (namely, Kuhnosen Zanko and Hosokura) which are being worked side by side in a small area of the district of Kalung. They are said to have to be classed among the largest producers of gold in Japan. Across the whole area of the province of Satsuma is [illegible] There are many mines which have been worked from the most ancient times. The mines of Yamagata, Sengane, Ushu, Okushu and Kaga are the most famous, but some of them are now almost [illegible]. Among others in Kyushu, the most prominent mine is the Hosaka which is growing in production and undoubtedly in a few years will be one of the largest gold producers. In the island of Shikoku and the whole western part of Honshu there are scarcely any remarkable gold mines. In the provinces of Idzu, Kai, Hida, Noto, Kaga, and Tamba, there are small producers. In the northeastern part of Honshu many new deposits have been lately discovered, though most of them are not yet producing. The prospect here seems to be good. There are extensive deposits and impregnations in Iparite or Tertiary tuff, although most of them are of low grade. In Hokkaido the prospecting has been insufficient and only a few occurrences are known. During the five years from 1899 to 1904 the placer workings in this province were exceedingly prosperous especially after the discovery of the Yesashi, but that condition lasted for only a few years. In Sakhalin, there are a few localities where placer work was at one time carried on in the regions where Paleozoic formations outcrop. Work at all of these is at present suspended. All the important localities of gold deposits now worked are restricted to the inner side of the North and South Japan arc, with the two volcanic zones of Kirishima and Fuji. On the other hand, the outer side of the arcs, numerous veins which are not worked now, are in the pre-Tertiaries, together with resulting placers. This generalization coincides with the fact that in the inner side of the arc many neo-volcanic rocks, which are the chief sources of the deposits, are developed, while in the outer side they are rarely present.

The zinc-lead fields of Missouri, extending over into Kansas and Arkansas, are in what is termed the Ozark uplift, and make up one of the most extensive and valuable mineral regions in the world. Up to the present no intrusive rocks have been found associated with these ore deposits, or near them. These deposits are of the few anomalous occurrences of an abundance of ore with no apparent connection with eruptive rocks of any kind. The formation is limestone and chert and belongs to the Carboniferous. Below these rocks are Ordovician dolomites and sandstones for many hundred feet. The ore occurs in chimneys, pipes, and sheets. The mines are mostly operated by a system of leases.

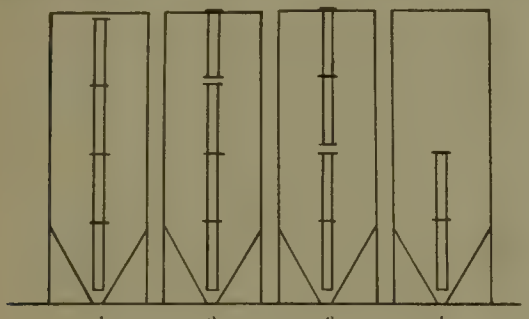
Discussion

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

A Modification of Pachuca-Tank Practice

The Editor:

Sir—In view of inquiries received for further details of the modified Pachuca-tank practice as carried out at the plant of the Zambona Development Co., which I described in your issue of October 22, I send the following: In all cases of cutting of the column pipes, the upper portion was first raised about eighteen inches, thus allowing most of the



1. Normal position of column pipe.
2. First alteration made.
3. Second alteration.
4. Final form adopted and used.

pulp to escape at the point cut, some of the pulp continuing to flow upward to the top and over the raised portion of the pipe. Noting the beneficial effects of the change, the raised portions of the pipes was removed entirely from all the tanks. The accompanying sketch, with explanations at foot, will, I think, make the whole operation clear.

AMOS J. YAEGER.

Minas Nuevas, Sonora, Mexico, November 15.

Metallic Sulphides in Alluvial Deposits

The Editor:

Sir—The interesting contribution by F. Lynwood Garrison on this subject calls to mind tests made on sand concentrated at one dredging property. These experiments were made during September 1909, in an endeavor to ascertain whether there was a loss in dredge tailing of sufficient importance to justify any attempt to save the gold so lost. The results obtained were as below. The sample called 'sand' consisted of material finer than ⅛ in. screened out from the tailing.

Sand.—The sluice material constituted 40% of the bank gravel. The sample of sand was 46% of the sluice material, and contained 15c. per cubic yard. Hence, 46% of 40%, which is equal to 18.4% of the bank gravel, at 15c. per cubic yard, represents $0.0276 per cubic yard, bank measurement. This sample was obtained when the dredge was digging in a rich streak; and if it be assumed, for the purpose of illustration only, that the rich streak was 3 ft. thick, it would then be necessary to divide the figure just given by 10 to get the amount per cubic yard, for the whole depth of bank, namely, $0.00276 per cubic yard. Under this view of the case, the loss is insignificant.

Black Sand.—The proportion of black sand contained in the sample of 46% of the sluice material, was determined and found to be 2.9%, and having a value of $1.79 per ton, or $2.68 per cubic yard of black sand. Hence, 2.9% of 46% of 40% = 0.53% of the bank gravel and 0.53% of $2.68 = $0.0142 per cubic yard of the bank gravel. But again, this black sand was obtained when the dredge was digging in a rich streak; and if, for the purpose of illustration, the same divisor be assumed as used in the case of the sand, it will represent but about $0.0014 per cubic yard for the whole mass of gravel handled by the dredge. No method is yet known by which these very small amounts of gold per cubic yard may be economically recovered. The black sand was tested by A. A. Hanks, who found that the gold therein contained may be recovered by cyanide, but it is a well established fact that the black sand itself cannot be separated from the tailing at a cost that will be covered by the value of its contained gold.

El Oro experiments indicated an extraction of from 97½ to 98% of the gold content of the bank. A Butte experiment showed 0.6c. per cubic yard of the sluice tailing; divide this by 2½ and there remains a loss of 0.24c. per cubic yard of bank gravel. While these data may not be perfect, they are, so far as I know, the best available on dredge recovery.

WM. S. NOYES.

San Francisco, December 20.

Cyanidation of Concentrate

The Editor:

Sir—In your October 1 issue, 'Ingeniero KCN' asks for information about the treatment of unground concentrate. Sulphides direct from the vanners are being successfully treated here by percolation. Little headwater is used on the machines and about 50% coarse sand is allowed to come over with the concentrate. The material is dug out of the boxes and trammed directly to the vats. Lime is mixed with the charge, the amount varying from 6 to 9 lb. per ton of concentrate. Nothing is gained by giving water washes after addition of lime, as all ferrous salts dissolved will be re-precipitated as hydrates. The ore here contains a considerable amount of arsenopyrite, and a high alkalinity is maintained. About 0.50% titrating with deci-normal oxalic acid gives the best results. Pumping solution on the charge intermittently and allowing it to drain probably helps the extraction, but the method is slow. Blowing air up through the charge is more efficacious. Transferring from one vat to another is to be recommended where cheap labor is available. Excess of lime tends to form an incrustation in the pipes. The first solutions coming off will sometimes carry lime compounds in suspension, which, if allowed to run to the precipitation boxes soon coat

the zinc and prevent contact. I find that the only way to deal with these cyanid solutions is to run them direct to the sumps, passing the zinc boxes and pumping up again when adding strong cyanide to the stock tank. In the treatment of concentrate here the first solutions coming from a vat contain no free cyanid and carry little gold hence they are run to waste. When necessary, water is added to the stock tanks to supply the deficiency. By this means the solutions are kept in good condition. The concentrate in question assays from $7 to $10 per ton and a 65% extraction is obtained. The ore is crushed through 15-mesh punched iron screens.

G. CHESTERTON EVANS.

Kuk San Dong, Korea, November 17.

Avino Mines Company

The Editor:

Sir—My attention has been drawn to a letter published in your issue of November 5, over the signature of Ralph Nichols, formerly manager of the properties owned by this company. Mr. Nichols' statement to the effect that he suggested the shipment of a quantity of ore to Henry E. Wood, of Denver, for testing purposes is correct, but as there was no reason, at that time, to anticipate any improvement on the extraction obtained by water concentration in 1900, the directors did not feel warranted to act on Mr. Nichols' suggestion.

Some time after Mr. Nichols had severed his connection with the company, Mr. Wood advised the Avino board that he had perfected a new system of water concentration, which he felt sure could be applied to the Avino ores, and that high extraction would result. The directors then decided to ship a quantity of ore to Mr. Wood, and on receipt of his preliminary report instructed me to go to Denver to investigate the system and see further tests made. Mr. Nichols' statement to the effect that this company adopted Mr. Wood's recommendations without investigation is therefore incorrect. Mr. Nichols states that the "experimental plant was installed some two years ago, so that by now the company should be fairly out of the experimental stage." As a matter of fact, the erection of the experimental plant was not started until October of 1909, proving conclusively that Mr. Nichols has assumed to write on a subject of which he knows nothing. In Mr. Nichols' last report to the Avino Mines of Mexico, Ltd., he states that there was approximately 107,000 tons of ore, estimated as in sight, in the mine, and in his letter, under review, takes credit for having developed 100,000 tons of ore, in addition to several thousand tons of copper ore, which were shipped during the 'development' of these reserves. These remarks suggest the ridiculous assumption that there were no ore reserves in the mine at the time when Mr. Nichols took charge of the property, and do great injustice to the former management. There is another point to which reference should be made, that of capital. The Avino Mines of Mexico had about £30,000 available shortly after Mr. Nichols assumed the management, all of which was paid out during the 'development' of the 100,000 tons claimed. This is a large amount of money when compared with about $100 with which operations were resumed in April 1909 after the mines had been closed for over a year. During Mr. Nichols' term of management copper sold up to 24c. per pound and silver up to 66c. per ounce, as compared with 14c., the highest price for copper, and 56c. per ounce for silver since operations were last resumed.

S. H. JOHNSON.

Gabriel, Durango, Mexico, December 14.

Proposed New Mining Method

The Editor:

Sir—I have read with interest your editorial in the issue of November 26, commenting upon my article which discusses a proposed change in mining methods, and would like to add a few words to what has already been said. Without experimental data, a theoretical discussion of the possibilities loses much of its value, yet it may be useful in showing where the most serious obstacles are apt to be encountered. I do not agree with the editor that the most difficult part of the work in a channeling method would be in the breaking out of the blocks of rock between channels. When it is remembered that a man with a double-jack can often break up a rock as much as two feet thick, it does not seem a very difficult task for a machine a hundred times as powerful to perform the same operation. In quarrying, the object sought is to break out the blocks of rock in one piece, in mining it would be the object to break it into fragments suitable for handling. It is quite probable that in mining, rock would be found that could not be broken by channeling 20 in. apart, and that figure was only given for assumed average conditions. For more difficult conditions the channels would necessarily be cut at more frequent intervals, the same as in blasting, holes are drilled closer together and more dynamite used.

From a theoretical standpoint the possibilities of the proposed method resolve themselves into two phases: first, the mechanical, and second, the economical. The mechanical difficulties can only be overcome by actual trial and experiment. A discussion of the economic possibilities would be of interest, and I would like very much to see such a discussion by some one possessing the necessary data. In using dynamite the power required in the breaking of the rock is generated and used at the point where the work is to be done. In a channeling method the power would be generated on the surface of the mine and applied underground. Aside from the element of time, which depends solely upon the mechanical phase, the question seems to hinge largely upon the relative costs of the two methods of power generation and application. Dynamite has one great advantage, that of position within the rock, but possesses also a serious disadvantage in that the expenditure of energy can not be closely regulated. Data giving the relative cost of power generation from dynamite and from other sources would be of interest in this connection.

G. E. WOLCOTT.

Polaris, Arizona, December 10.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Very little tin is produced from stannite, the sulphide of tin, by far the greater part of the metal being obtained from cassiterite, which is found in commercial quantities in both veins and placers.

The flat-steel wire wrapped around the suction-hose of mine-pumps is not to prevent the water from bursting the hose, but to prevent its collapse from atmospheric pressure when the pump is in operation.

It is a wise miner who knows when to quit a mine that has once been profitable, but which is no longer so. Some mines have had several distinct periods of prosperity and adversity in their history—being much like men, in this respect.

Cross-cuts are an essential feature of proper mine development. Many a good vein or orebody has been missed by an otherwise competent miner by failure to cross-cut beyond the confines of the vein. Always drive cross-cuts systematically or you may overlook a fortune.

In cleaning boilers, allow the fire to die out and the pressure to run down to zero. Admit air on top, take off the plates and use the hose thoroughly, then clean out all remaining scale. Examine all available parts and have defects repaired. If grease gets into the boiler, use sal soda to neutralize it, and see that the grease is kept out thereafter. It is dangerous to have grease in a boiler, dangerous to the boiler and dangerous to your personal safety.

The standard flask of quicksilver contains 75 lb. The production of quicksilver has fallen off greatly throughout the world, but fortunately, perhaps, for all except the producers of the metal, the demand for quicksilver has been reduced correspondingly by the introduction of other methods of recovering gold and silver from their ores, including cyanidation, chlorination, various lixiviation processes, and a great improvement in and reduction of cost in smelting.

To line up a vertical shaft when sinking, four lines, one near each corner, are necessary for perfect alignment. It cannot be done by hanging a line at the centre of each wall-plate. The centres may be in direct line and true, but the shaft can easily assume the well-known 'corkscrew' condition when this method is used. For rough work an incline shaft may be kept in alignment by keeping the rope in the centre of the track. Even a slight deviation to one side or the other can be quickly detected.

Gash veins are superficial fissures which extend to comparatively shallow depths. They may be due to any one of a variety of causes, among them being the stretching, which occurs on the crest of an anticlinal fold; shrinkage in igneous rocks, and fracture due to earth movements. Some so-called gash veins are evidently only the lower part of a lens of quartz, the upper portion having been removed by erosion. This lens may be one of a series, extending both horizontally and vertically for a long distance.

The water in copper mines usually contains copper sulphate in solution, the amount of copper present varying somewhat, dependent upon the state of oxidation of the copper in the ore. At many mines it has been found profitable to pass the water, flowing or pumped from the mine, through a series of tanks or boxes containing scrap iron, and tin scrap, upon which metallic copper is precipitated from the solution. This cement copper, as it is called, contains about 60% copper, the balance being iron and earthy impurities.

A large mill is usually capable of more economical work than a small one, though there is a limit to this. For instance, the crew usually necessary to run a 10-stamp mill, can run a 20-stamp mill just as well. However, there are mills—5 stamps and less—where one man does everything on each shift. He looks after the plant supplying power; occasionally goes to the rock-breaker, attends the feeders, looks after amalgamation, and only on clean-up day does he have an assistant, when the night man stays on shift until that work is finished.

Seismographs are delicate instruments employed for the purpose of registering automatically earthquake shocks, both as to time, duration, and intensity; but no instrument made can foretell an earthquake, nor can the weather be relied upon as a means of predicting seismic disturbances, no matter of what character. The locus of a distant earthquake can be determined approximately by the length of duration of the tremors. It is only recently that scientific observers have been able to do this, and among the first to make use of this knowledge were Japanese scientists.

Spherical concretions sometimes observed occurring in sandstone are the result of an arrangement of the grains of sand about some nucleal body, usually a small quantity of organic matter, such as a piece of wood deposited with the sand. The sand in some strange way is arranged by nature in concentric layers about this centre, forming a globular mass of greater or less size. Near Los Angeles, California, concretions are known to occur up to 30 in. diam. In some instances these sand spheres contain a large percentage of iron oxide. They are then much harder than when the iron is absent, and the concentric structure is usually much more pronounced. On a stream tributary to the Missouri river in North Dakota, there are millions of these iron concretions scattered over the surface, the result of erosion of the sandstone in which they were formed. The stream is aptly named the Cannon Ball river. Concretions of copper ore are found in some rocks, particularly the Permian, which are formed in a similar manner. In that formation also occur fossil fish and other fauna turned by metasomatic process to an ore of copper and silver.

Special Correspondence

BULAWAYO, SOUTHERN RHODESIA

Mining in Southern Rhodesia — Globe & Phoenix — New Company Acquires Properties — Bulawayo and Salisbury Rivals — Activity at Gatooma

The output for the month of the Globe & Phoenix mine has not increased as much as the company expected, and consequently a few hundred tons more will be required to bring the total up to 30,000 per month, and the good outlook of the whole of Southern Rhodesia as a mining country will be fully realized. It is evident that the contemplated underground operations of the Globe & Phoenix would affect the dividends to a large extent. The latter continues to be carried on satisfactorily, and the ore reserves, width and quality of the lodes in the mine are reported to be being extended all the time. This is the deepest mine in Southern Rhodesia, and the results obtained in the lowest workings are of the greatest importance to the company and to the country. Since it has been often alleged that Rhodesia is a "country of small rich quartz shoots." At the end of last year the company had 171,567 tons of ore in reserve, the gross value of which was estimated at £1,143,780, as compared with £487,020 at the end of 1909. It is understood that during the current year this tonnage has been largely added to and that the value of the ore in reserve

Typical Rhodesian Small Mine.

has been augmented. Prominent among Johannesburg and London firms which recently have acquired interests in Rhodesia is the Consolidated Mines Selection Co., which has floated a subsidiary enterprise, styled the Rhodesia Mines Selection Co., to acquire and work properties in Matabeleland and Mashonaland. T. G. Hamilton, president of the Transvaal Chamber of Mines and managing director in South Africa for the Consolidated Mines Selection Co., recently visited Rhodesia, and selected Salisbury as the headquarters of the subsidiary company. Interests have been acquired in both Matabeleland and Mashonaland, the most important being the Arizona in the Twelo district and the Buller and Turkois in the Lomagundi district of northern Mashonaland. The managing director in Rhodesia for the Con. M. S. Co. is Lewis Evans, formerly general manager for the New Modderfontein company. Opinions vary as to which is likely to be the premier town of Southern Rhodesia. At present Bulawayo and Salisbury are the principal rivals. It is largely a question as to which town can lay claim to the most important mining developments in its vicinity. Until recently Bulawayo had an advantage in this respect, but later the important discoveries made in the Abercorn and Enterprise goldfields, in the vicinity of Salisbury, have brought about a marked growth in population there. Salisbury, too, is the seat of the Government. Most of the important mining houses operating in Southern Rhodesia have their head offices in Bulawayo, and many new mines are being developed in the vicinity of the town. On the railway line between these two towns—the capitals

[illegible]

LONDON

The Consolidated Gold Fields.—Production of Main Reef West.—Tin Deposits.—Lena Goldfields Company.

The yearly statement of the Consolidated Gold Fields of South Africa is always looked forward to with great interest, as it is a typical example of a promoting, or parent company originally formed to develop properties on the Rand, and more recently expanded as to its sphere of operations. It is also notable because it was the company identified with Cecil Rhodes' connection with the Rand. The Simmer & Jack was the property acquired on the outcrop to the east of Johannesburg and it has proved to be one of the most important producers in this goldfield. Subsequently deep levels in the vicinity were acquired, among which Simmer Deep, Simmer East, Knights Deep, and Jupiter are the most important. The company also acquired and developed the Robinson Deep, further to the west, and holds much of the property adjoining to the south of Robinson Deep, notably the Turffontein. The report of the company for the year ended June 30 shows a profit of £993,381, as compared with £1,282,851 a year ago. The policy of writing down the assets to keep pace with the exhaustion of the mines is being continued, but, whereas £500,000 was devoted to this purpose a year ago, the sum of £200,000 is sufficient for that purpose this year. Dividends at the rate of 6% have been paid on £1,250,000 preference shares and 35% on the £2,000,000 ordinary shares. During the year the debentures have been reduced by £25,000 and now stand at £250,000. The reserve fund remains the same as before, namely, £2,000,000, of which one-half is used in the business of the company and one-half in government securities. The chief income of the company is derived from dividend-paying mines on the Rand, of which those already mentioned are the most important. The company also has a large interest in City Deep, which will be producing within the next few months. The list of other investments published in the report is, as usual, of great interest. The Shamva and other Rhodesian companies, and the Fanti, Wassaw, and other West Africans, account for large sums of money. The company has substantial holdings in the Victoria Falls & Transvaal Power Co., the Lena Goldfields, Oroville Dredging, Natomas Consolidated, and many other companies operating in various parts of the world. One investment representing about £50,000 is in the Northern Light Power & Coal

Co operating in the Yukon district, of which little is heard though its headquarters are in London. The report states that the mining operations on the Rand under the control of the company have been greatly hampered by the scarcity of native labor, and in Rhodesia and West Africa the same trouble is predominant.

The development of the Main Reef West property in the near western Rand, belonging to the Neumann group, is of special interest at present. This part of the Rand has not been as successful as others and the success of this new deep level is therefore of some importance, especially as it adjoins the Banffies the new property about which so many mysterious prognostications have been made. Operations were started at Main Reef West in May 1909, with 50 stamps and an additional 40 have since been erected. Two tube mills have been erected and another has been ordered, but none has been put in operation as the amount of ore mined has not yet overtaxed the capacity of the 50 stamps which can consistently do the whole of the present output to 20 mesh. The development and further equipment of the mine are progressing rapidly, and considerable shaft sinking has been done. It is expected that it will be possible to greatly increase the output in about a year's time. During the year ended June 30 an average of 197 stamps treated 189,649 tons, yielding by amalgamation 16,257 oz, and by cyanide 57,101 oz, a total of 73,191 oz gold valued at £297,787. The yield was 7¾ dwt., or 7s 8d per ton and the extraction was 92%. The working cost was £159,837 leaving a profit of £137,950, the figures per ton being 17s 11d and 14s 6d respectively. The company has been able to declare its first dividends, No. 1 and 2 amounting in all to £112,500 which is at the rate of 25%. During the year additional capital expenditure has been incurred, chiefly in connection with shaft sinking and equipment to the amount of £50,655, of which £5648 has been provided out of revenue and the remainder out of the proceeds of an issue of £200,000 debentures specially made two years ago for this purpose. The reports by the engineers show that progress is continuous and that the ore reserve is 74,000 tons higher than a year ago standing now at 420,000 tons averaging 7.9 dwt. The outlook is therefore highly encouraging.

Tin deposits in South Africa are gradually assuming an important position. Many of the more prosperous companies are operating gravel properties, and their concentrates bring high prices in England. Others which are developing vein mines have found unexpected difficulties in recovering the tin oxide. One of these is the Rootberg company which was formed in May 1908 to acquire mines in the Rustenburg district, Transvaal, situated in the northern slope of the Rootberg range of hills 10 miles west of Warmbathe station and 70 miles north by west of Pretoria. The original promoters, the Oceana Consolidated, were not successful with the property, and the control is now with the Anglo-French Farrar group. During the year ended June 30 the 10-stamp mill crushed 14,714 tons and produced 622 long tons of tin concentrate having an average content of 65.3%. The extraction was only 62%, and the middling tailing and slime have been saved for further treatment. The new consulting engineer, Edward J. Way, requisitioned the services of Amos Treloar, who did much good work at the dressing works at East Pool, Cornwall. Between them they are designing a modified plant with the object of effecting a greater saving. The developments at the mine are in the meantime proving satisfactory and the reserve on June 30 was 31,500 tons averaging nearly 2% metallic tin. The receipts from the sale of concentrate were £56,175, and the working profit was £12,681. In order to provide for the new plant the capital of the company has been raised from £150,000 to £175,000 by the issue of 50,000 new shares which were sold at 30 shillings.

Lena Goldfields company was formed in 1908 to acquire the control of a Russian company. The Lenskoie, which has worked for many years alluvial gold deposits in valleys adjoining the Vitim river, a tributary of the Lena. Bodaibo is the town on the Vitim, being the centre of operations. It is at the mouth of the river of the same name. The flotation in London was in the hands of the Venture Corporation and the Consolidated Gold Fields of South Africa, for whom C. M. Rolker reported on the properties. The total share capital is 1,122,216 in £1 shares, of which 753,838 was purchase price and 368,378 was subscribed in cash for working capital, the total amount received being £401,815. The holding in Lenskoie shares represents 71½% of the total. The revised figures for the profit of the Lenskoie for the year, October 1908 to October 1909, were £519,455, as against £400,000 estimated. For the year October 1909-10 the extraction as reported by C. M. Rolker was about £1,000,000, and the managing director, Baron Alfred de Gunsburg, estimates the profit for the year at £600,000. The Lena Goldfields has just published a statement for the 15 months ended September 30 which shows a profit of £262,238, chiefly derived from the profits of the Lenskoie for the years 1907 to 1909. The only dividend so far distributed was one of 10% paid on November 25 last year, absorbing £112,221, and the directors now recommend the payment of another dividend of the same amount on December 22. During the year additional property has been acquired from the Industrial company, and property has been leased from the State Bank.

GOLDFIELD, NEVADA

The Consolidated Company's New Storage Batteries. — Development of High-Grade Ore.

During last week the newly installed storage battery and power equalizing plant of the Goldfield Consolidated Mines Co. was given its first practical emergency test, with results that were satisfactory and which demonstrated beyond question the value of the plant as a factor for economy in operation. For nearly nine hours the power supply from the main line between this district and Bishop creek, California, was cut off while the transformers at Alkali Springs, twelve miles west of Goldfield, were being moved from the old building to a new steel and concrete structure. From this point a northern branch of the line diverges to Tonopah. In the past when the power supply from the main line was interrupted all operation of machinery in the mines and mills was suspended, but with the aid of the new plant the Consolidated company was enabled to continue the operation of hoisting machinery, raising and lowering the miners, although no ore was handled by the hoists during this time. All the electric lights in mines, mill, and other buildings were kept burning, pumps were operated without interruption, as were also most of the machine drills and compressors, and the mill continued working, though at reduced capacity. The storage bins at the mill have a capacity of 2000 tons and always contain at least a day's run as a precaution against shortage from any cause. The new electric plant is the outcome of exhaustive experiments conducted during the past two years by L. T. Merwin, the company's chief electrical engineer, who has visited and studied a large number of electrical plants throughout the country. By means of this system the stored energy is drawn upon at the moment of starting hoisting and other machinery, when the dial indicators register the 'peak' load, thereby maintaining greater uniformity in power used, minimizing the peak load, and resulting in a material saving in cost of power. All new buildings that have been in process of construction for several months are nearly completed, including the enlarged and improved refinery, and from this time forward this item of expense will be small. J. R. Finlay, the manager, has returned from New York, where he went to attend the quarterly meeting of directors, and it is expected that the report for the month of November will contain interesting information regarding the latest developments in the mines. From the 1000-ft. level of the Clermont a raise is being driven in the orebody exposed some time ago, and the result of this work has demonstrated the magnitude of the deposit at this depth, by showing the continuity of the seams of high-grade ore accompanying that of milling

SALT LAKE, UTAH

Utah Copper's Dividend — Park City Merger not Probable — The Tintic Mines — Water in Columbus Con — The Result

Utah.

In the Tintic district the Yankee Con. has levied assessment No 4 of 2c. per share. The amount thus raised will be used to pay for the completion of a contract to sink the shaft 400 ft., and the contract price for sinking another 800 ft. Uncle Sam has declared a dividend of 5c. Iron Blossom, with $60,000 in its treasury, passed its usual dividend at the annual meeting at which the old board of directors was re-elected. Current report is that the company is undecided whether to declare a dividend or use the money to build a mill for concentrating the low grade ore. The Opex has levied an assessment, and the Colorado has declared its usual quarterly dividend, this time 6c. per share, amounting to $60,000, bringing the total up to $2,300,000.

Two lessees working on a ten acre fraction wedged in between the King David, Peacock Copper, and Cupric, in the Frisco district, opened a vein of rich lead ore at the surface. The claim, on being explored, showed three distinct fissure veins, and a 10 by 12 ft. pit sunk 15 ft., was all of the way in ore. An interesting feature of this item is that the fraction formerly belonged to the King David, and when this portion of the ground was surveyed the fraction was left out as being of no consequence.——At the Columbus Consolidated there is a surfeit of water in the 400-ft. shaft from

BUTTE, MONTANA

Mountain Mine to be Re-Opened — High-Grade Ore From the West Colusa — November Copper Output

With the assistance of the Anaconda company, W. A. [illegible] proposes to secure water control on the deeper levels of the Mountain View group, a property [illegible] which has been operated by A. Hyde & Son. The Pluto section of the Anaconda company's area is a promising one, and has been [illegible] Clark Consolidated Mining Co. will be given title, before the end of next week. A [illegible] of 12 men commenced work at the shaft will have to be deepened. This is now in progress. The Vanzant is [illegible] deep, and its ores [illegible] one of the best silver producers in the West. The West Central [illegible] of the Boston & Montana company is shipping [illegible] ore to the Washoe smelter. It is said that the ore is one of the richest ever hoisted out of a Butte property. Generally all the ore taken from the original Boston & Montana properties is sent to the Great Falls smelter. The petition of the minority holders of Parrot company stock for an appointment of the [illegible] of the company, has again been continued, this time to January 9. The attorneys for the Anaconda company and the Boston minority holders of the stock were both agreeable to the further postponement. There is a belief that arrangements may yet be made whereby the Parrot petitioners will come to the conclusion that the holders of Parrot stock got a very fair deal when the majority decided to sell to the Anaconda company. ——F. A. Heinze has lost one of his ablest and most capable men in Montana, December 1, through the retirement of Charles R. Leonard from all connection with the business of Mr. Heinze. For several years Mr. Leonard was at the head of the Heinze legal affairs in this city and was the leading spirit in the organization of the Davis-Daly Copper Mining Co. ——The November output of the mines of the district amounts to 22,000,000 lb. of copper, of which the Washoe smelter at Anaconda turned out 16,000,000 lb. the Great Falls smelter 5,000,000, and the East Butte smelter 1,000,000. In the 16,000,000 lb. from the Washoe smelter is included 500,000 lb. of copper belonging to the Tuolumne company and nearly 2,000,000 from the North Butte mine, while in the Washoe returns there was some ore from the West Colusa of the Boston & Montana group. As compared with October, the returns show an increase of 100,000 lb. from the Washoe smelter, and a decline of 300,000 from the Great Falls smelter. The decline in the Great Falls return is due to the fact that some of the ore usually going there was sent to the Washoe in Anaconda, and to the further fact that more low grade ore was shipped to Great Falls in November than in October.——The Elm Orlo is shipping nine cars per day, five being zinc and four copper, and the Poser is sending three cars per day to the Washoe smelter. The zinc ore is being treated at the Clark concentrator at the Butte Reduction Works.——Some time ago the Butte & London Development Co. held a special meeting of the stockholders to consider the raising of $10,000 to assist in paying off a judgment for personal injuries, amounting to something like $17,000. The meeting did not take kindly to the mortgaging of the property, so now the machinery of the company is being advertised for sale, which is taken to mean that the directors will not operate the property for

some time to come.——A hoist has been installed in the 1200-ft. station of the Tuolumne mine, and sinking the shaft from the 1400 ft. level to 2000 ft. has been commenced. This will not interfere with the regular hoisting of ore. ——The stockholders of the Butte & Superior company are still waiting for official information on the financial condition of the property. There are reports that a large portion of the bond issue remains unsold and that the management is unwilling to have the bonds fall into possession of outsiders, although it is stated that there are financial interests willing to take $500,000 worth of the securities on the same terms as they have been offered to stockholders.——The Butte Central Copper Co., operating the Ophir mine, is to build a concentrator. An unsuccessful effort was made to have the ore treated at the smelters, hence the decision to erect the mill. Freeman Davison, the organizer of the Butte Central Copper Co., has been in the city making an examination of the property and arranging for further improvements and the development of the Ophir mine. Miners on the 500-ft. level are blocking out ore, while a crew is sinking the shaft to 1000 feet.

WASHINGTON, D. C.

Projected Oil Land Legislation.—Alaskan Mining Claims.—Test Coal Land Case.—Potash Controversy.

With the opening of the session of Congress last Monday came a batch of mining bills, the most important of which is that introduced by Reed Smoot, Senator from Utah, which provides for the granting by the Secretary of the Interior of permits to explore and prospect for oil and gas on unappropriated and withdrawn lands. One provision of the measure is that the lands covered by a permit shall be in a compact body, not over four miles in length and not to exceed 1280 acres, and no more than one permit shall be held by any person, association, or corporation. The applicant shall pay five cents per acre for the right to explore and prospect.——Knute Nelson, Senator from Minnesota, and chairman of the Senate Committee on Public Lands, has introduced by request a bill regarding mining claims in the District of Alaska. Briefly, it provides that no person shall locate an area of more than two full-sized claims, whether they be placer or lode claims. A placer claim shall not exceed twenty acres in area, and a lode claim not more than twenty and sixty-six one-hundredths acres; that all mining claims hereafter located shall be rectangular in form unless prevented from so being by the lines of previously located claims; and placer claims shall not exceed 660 ft. in width, or 1320 ft. in length for each claim; nor shall lode claims exceed 600 ft. in width, or 1500 ft. in length; that the location of association placer mining claims and the extralateral rights to vein or lode claims as provided for in the statutes be hereby abolished as to the District of Alaska.——Weldon B. Heyburn, Senator from Idaho, introduced a bill to exempt owners of unpatented mining claims from performing annual labor upon such claims for the year 1910 by reason of the losses suffered by these owners by forest fires.——Donald A. McKenzie, of Alaska, was arrested in this city, December 8, on a requisition from the United States authorities at Spokane, Washington, in connection with alleged land frauds in Alaska. Mr. McKenzie was released on bond by a United States Commissioner. The allegation in the indictment is that McKenzie, with four others, conspired to fraudulently procure title to about 2000 acres of coal land in the Katalla district, Alaska. The Government's contention is that a coal locator may not lawfully enter into an agreement prior to completion of entry to sell his claim, and that no other person may lawfully enter into an agreement to buy his claim prior to its completion. It is understood that it is practically a test case of the Government's position in regard to coal lands in Alaska.——Prominent lawyers from Philadelphia, New York, and Baltimore have been urging Philander C. Knox, Secretary of State, and John B. Osborne, chief of the Bureau of Trade Relations, to adopt a vigorous policy toward Germany in connection with the refusal of that government to permit the execution of the contract which Americans hold for the delivery of potash from German mines.——The United States mints during the month of October coined more than $14,000,000, of which more than $13,000,000 was in gold.

ALPINE, TEXAS

The West Texas Mining Congress Organized to Formulate Changes in State Mining Law.

The movement of mining men and others to bring about the enactment of a new mining law which will encourage prospecting upon lands owned by the State of Texas, and protect the owners of mining claims, took definite shape at a recent meeting of the West Texas Mining Congress held here. The special object was to discuss the matter of proposed mining legislation and to memorialize the legislature, which is due to convene in January, to repeal the existing mining law because of its obnoxious and unsatisfactory provisions. More than fifty representative mining men from different parts of western Texas were in attendance. The meeting marked the inauguration of the West Texas Mining Congress, of which J. D. Jackson, of Alpine, was elected president, H. C. Phillips, vice-president, and W. J. Yates, secretary. After a general discussion, resolutions were submitted and adopted voicing the sense of the meeting. These resolutions approve a portion of the mining law that

Terminal of Del Carmen Mining Co. Tram in West Texas.

was passed by the last legislature, but which was vetoed by Governor Campbell because it contained an unconstitutional provision relating to the State's control of minerals upon islands along the Gulf Coast. The Congress held here recommends that this unconstitutional provision be omitted from the new bill, and that the following changes and additions be embraced in the same:

"1. That a uniform price be placed upon all mineral lands, as follows: For lands containing precious minerals, $15 per acre; for lands containing the baser minerals, $10 per acre, provided such lands are situated within five miles of a railroad; and $5 per acre for land more than five miles from a railroad.

"2. That an appropriation be made for the purpose of carrying on the work of the mineral survey in western Texas, which was discontinued in 1905; that said appropriation is to be for a study of the geology and the mineral resources of Texas.

"3. That this Congress is opposed to any plan whereby

the owners of mineral lands would be required to pay no royalty to the State of Texas from minerals mined from the lands so disposed of.

J. T. Robison, State Land Commissioner, is an advocate of the proposed mining law containing a provision by which a stipulated royalty shall be paid the State on all ore extracted from mines operated upon State lands. If he does not recede from his position on this question it is probable that it will be the chief subject of contention when the matter of enacting the new law comes before the legislature. The State of Texas owns several million acres of land in the Western part of the State on some of which rich minerals are known to exist, but owing to the lack of an adequate mining law very little has been done toward the development of these resources. Under the present law the State Land Commissioner has absolute authority to fix whatever price upon the land that he may see fit after the mining claim has been brought to a producing stage. No one cares to develop a claim in the face of the uncertainty as to the price he may have to pay the State for the property.

NEW YORK

Second Conference of Copper Men. — A More Effective Curtailment Desired.—Lake Superior Mines.—Boston & Montana.—Comment on Western Mines.

There was another banquet at Sherry's this week for the copper producers. The initial 'spread' was given by John D. Ryan; on this second occasion, Eugene Meyer, Jr., was the host. Among Mr. Meyer's guests were George W. Perkins, John D. Ryan, Daniel Guggenheim, Solomon Guggenheim, Murry Guggenheim, W. C. Paine, W. B. Thompson, B. B. Thayer, R. L. Agassiz, Chas. M. MacNeill, Urban H. Broughton, and Thomas W. Lamont. The occasion was evidently a Guggenheim affair. The host is the head of the house of Eugene Meyer, Jr., & Co., one of the large houses on the New York Stock Exchange, and is looked upon in banking circles as an ally of J. P. Morgan & Co. The Guggenheim interests are largely backed by Morgan & Co., and it was Mr. Perkins, of the Morgan house, who went to Alaska last year on a trip of inspection, covering the Morgan and Guggenheim mining and railway enterprises. Mr. Perkins has recently announced his early retirement from the banking firm, and it is said in many quarters that this is a preliminary step toward his becoming the financial head of a copper consolidation, in which he would presumably stand primarily for the Guggenheim companies. Mr. Lamont is to enter the Morgan house when Mr. Perkins goes out. Mr. Agassiz' presence is taken to mean that the Lake coppers are to recognize the exigencies of the situation. The present line-up in copper is very interesting. It is quite patent that the much-talked-of curtailment policy has failed to curtail effectively. There has been some reduction of the world's accumulated stock, all due, however, to an unprecedented foreign demand. It is to institute some regulation of output, that will save the metal market, that these dinners have been given. There is in sight the product of the developing low-grade milling coppers, and the necessity of some such action is apparent. It is believed on all sides that a copper merger will eventually result as a matter of necessity. It goes without saying that, when it does come, the banking interests will see that it is so constructed as to furnish some hundreds of millions of stock, to be sold to the public. The export demand for copper cannot be expected to maintain its present strength indefinitely. Actual exports for November were 60,882,000 lb., as against 48,056,000 for the same period a year ago, an increase of nearly 13,000,000 lb.; and with any material decrease in the foreign demand, the copper market would become weak. There is hardly a day without some item indicating a narrowing or unifying of the copper interests. J. Parke Channing, engineer for the Lewisohn interests, has been in the Lake Superior copper district for three weeks and is said to be engaged in making an appraisement of the subsidiary properties of the Calumet & Hecla [illegible] & Hecla [illegible] a bookkeeping [illegible] Lake Superior properties. This is in line with [illegible] There is certainly great disadvantage to the fact that the Calumet people should employ an engineer affiliated with the Amalgamated interests in an examination of their properties. Mr. Channing has been in Boston for nearly a week in conference with the Calumet & Hecla officers. Ray Consolidated and Chino are to join Utah Copper and Nevada Consolidated on the New York Stock Exchange. Boston & Montana is to be dissolved, all of its property having been sold and transferred to the Anaconda. The only asset it now holds is 1,200,000 shares of Anaconda which is to be distributed to Boston & Montana shareholders. Each share of Boston & Montana will receive eight shares of Anaconda. On the present market of $40 for Anaconda, Boston & Montana would have a market value of $320 per share. The last sales of Boston & Montana were considerably above this figure. The recent consolidation of the Calumet & Arizona and the Superior & Pittsburgh, while not particularly significant in the line of solidification. The consolidated company will be one of the first six or eight large producers of the country, the combined production of the two mines for November was 4,090,000 lb. While the Cole-Ryan group is strengthened by this move in Bisbee, there are weak links at Ely and in Cananea. Neither Giroux nor Greene-Cananea seem to have a friend in the market place. Greene-Cananea's 50,000,000 capitalization appears to wholly offset any rebuilding of the plant or reduction of copper costs, while Giroux is suffering from a lack of definite news. Most of the copper mines now developing have been giving out statements of ore developed and progress made, while from the Giroux there has been nothing forthcoming. The situation in Utah Consolidated has been an adverse market factor. It is said there was some heavy buying on the break by some interests who were not inclined to believe the worst. The $3,000,000 of 6% convertible bonds of the Ray Consolidated are said to have been all taken by the stockholders at par. Generally speaking, market conditions are unsatisfactory. There is an utter lack of leadership, and no cohesion in any part of the list. This is illustrated by the great variations in prices with reference to income. Chino, Miami, Ray Consolidated, and Nevada Consolidated are selling at practically the same figure. The initial production of the first three is still several months in the future. On present quotations Nevada Consolidated, at 18½, nets 8.1%; Utah Copper, at 46, 6.5%; Anaconda, at 40, 5%; Amalgamated, at 63, 3.2%. On the other hand, dividend-payers like Kerr Lake and Goldfield Consolidated, netting from 21 to 26%, do not enlist enough public support to bring the shares to anything like a parity with other dividend payers. The regular quarterly dividend of 30c. per share, together with an extra dividend of 20c. per share, has been declared by Goldfield Con., payable January 31 to stockholders of record December 31. The impression here is that a systematic campaign is being made to distribute this stock. The market shows it, and both the public and the stockholders are without sufficient data to form any conclusion as to the future life of the mine. The good news seems to appear after the quarterly declaration and while the shares sell 'with dividend.' There is no tendency to belittle the accomplishments of this mine, nor any ground to doubt its future. It is simply that shareholders are without adequate data, while the market shows that someone is 'cashing in.'——It is said that the French interests in Mexico Mines of El Oro have secured control of the property and that a change in the management is one of the possibilities of the near future. Cobalt dividend payers are making a rare showing for the close of 1910. The Canadian Silver Mines Exploration Co., which is a subsidiary of the General Development Co., has taken up its option on the Wettlaufer in South Lorain. The Lewisohn interests have had charge of the Wettlaufer for several months and actual operations have been under the superintendence of Mr. Heakes, general manager of the Kerr Lake.

General Mining News

ARIZONA

MOHAVE COUNTY

(Special Correspondence.)—The Tom Reed Gold M. Co. has been operating in the Goldroad district for three years, and has its mine opened by an incline shaft, which was sunk in the foot-wall, and has a depth of 500 ft. Driving on the vein is in progress on the 300 and 400-ft. levels, and a winze is being sunk from the 400 to the 500-ft. level. The vein strikes northwest through andesite, dips 73° north, and has a width of 5 to 20 ft. The 20-stamp mill is crushing only 50 tons per day at present, the extraction by amalgamation and the all-slime process of cyaniding reaching 95 to 97%.——At the Gold Road mine the new development consisted of driving 960 ft. east on the 700-ft. level, and 1500 ft. east on the 500-ft. level. Ingersoll and Sullivan drills are being used in driving, the Leyner for stoping. The new mill, having 40 stamps, two Trent Chilean mills, and two tube-mills, has a capacity of 300 tons per 24 hours.

Goldroad, December 12.

(Special Correspondence.)—The Cyclopic mine, 35 miles north of Chloride, is being developed under direction of A. M. McDuffee. It is bonded and leased to T. T. Powell, of Pittsburg. Surface development has exposed one orebody which is on the contact of granite and schist. Deeper development is being carried on by diamond-drills.——Sam Rhea has a contract to sink to 1000 ft. on the Tennessee, at Chloride, so the orebodies may be opened at that depth. The large tonnage of ore on the Tennessee dump, which samples $4.50 gold per ton, 5% lead, 16% zinc, and 12% iron, is being shipped to the concentrating mill of the Needles Mining & Smelting Co.——The Golconda mine of the Union Basin M. Co., situated in Cerbat district, is a heavy producer of zinc, the ore shipments showing 47 to 52% of that metal, and sufficient value in gold and silver to pay operating expenses. John Boyle, Jr., is the manager.——The Banner and other properties on Stockton hill are being developed by the Needles M. & S. Company.

Chloride, December 15.

YUMA COUNTY

The Consolidation Copper Co. has 140 mining claims, covering 12 miles of what is considered a mineralized zone in Cieniega district, south of Bill Williams fork, about equidistant from Bouse and Parker. Active as directors in the company are Thomas J. Carrigan, R. I. Rogers, and Frank Robbins, the last-named being consulting engineer. S. F. Parrish, formerly at Leadville and Rossland, is in charge of operations. According to Mr. Parrish's report of September 21, the work performed for assessment and development purposes aggregated over 3000 ft. at that date. One shaft has a depth of 200 ft., and from it two crosscuts, 25 and 59 ft., respectively, were driven through the vein; a 282-ft. adit was driven, partly as a cross-cut and partly on the orebody. Along the zone is a cropping of specular iron and red hematite, accompanied by azurite, malachite, chrysocolla, and cuprite; also some chalcocite and chalcopyrite. The ore occurrence varies along the belt, and is found in bedded veins in gneiss, on the contact of gneiss and limestone, and gneiss and intrusive rock. Mr. Robbins states that the assays of the orebody sampled averaged 8% copper. This group is in the same locality as the Planet and Clara mines.

CALIFORNIA

AMADOR COUNTY

The Lincoln Con. M. Co. sunk 150 ft. in the last quarter, and now has a 300 ft. shaft. The ore broken runs $4 to $5 per ton. For the quarter the company disbursed $8211.72 for labor, salaries, equipment, material, and supplies, and had a balance December 15 of $3356.26. On December 10 assessment No. 3, of 10c. per share, was levied. The company's office is at Jackson.

CALAVERAS COUNTY

The Economic mine at Esmeralda is being equipped with an extraction plant by which 200 tons per day can be treated. It is claimed there are 3000 tons of ore broken in the stopes. Other equipment to be put in consists of an air-compressor, generator for electric light, and a steam boiler. V. M. Weil is manager, and Oliver Reece is superintendent.

NEVADA COUNTY

The Coan mine, in charge of Dan McGonigal, has a new shaft-house and hoisting engine ready for use. The new mill building is complete, and the ten stamps, plates, and concentrating tables are ready to be put in place. The new shaft, only recently commenced, is to be sunk to a depth of 200 ft.——The Cassidy Con. M. Co., operating in Grass Valley district, has purchased a 100-hp. electric motor to drive the compressor. The shaft is to be sunk to a depth of 1200 feet.

SISKIYOU COUNTY

It is reported at Yreka that the Southern Pacific Co. contemplates building a railroad from the main line to Crescent City, Del Norte county, a distance of 70 miles, to reach the vicinity of the copper mines in western Siskiyou, notably the Blue Ledge, which belongs to Robert S. Towne and associates, who have had the property under development for several years. It is reported also that the Hill people have outlined a route from Medford to the Blue Ledge district which is four miles south of the Oregon-California boundary line.

SAN BERNARDINO COUNTY

(Special Correspondence.)—The smelting plant of the Needles Mining & Smelting Co. has two lead furnaces which

Concentrator Needles S. & M. Co.

have been in operation five months, treating 200 tons of ore per day, deriving the ore supply from the company's mines in the Cerbat range in Mohave county, Arizona, and from custom mines. A concentrating plant of 250 tons capacity was finished and put in operation last month to concentrate low-grade lead-zinc-iron ores. It is equipped with 22 Wilfley tables, one Isbell and three Johnston vanners, one Deister sand table, three Richards pulsator jigs, four Richards classifiers, one tube-mill, and two sets rolls. Under direction of M. B. Pickel, mill superintendent, tests are being made as to the adaptability of the various tables and vanners to concentrate the classes of ore received.

Needles, December 16.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.)—A contract has been awarded to John Hansen to drive 700 ft. westerly on the Santiago vein from the Wilcox adit. When the work is completed a 500-ft. raise is to be made to connect with the upper workings of the Santiago mine. Ore shipments from the Santiago amount to six carloads per week, having an average value of $1000 per car. The Argentine Central railroad will be kept open all winter to haul this product. B. Converry & Co., leasing at the Capital mine, are breaking ore from a 14-in. streak that mills 10 oz. gold and 35 oz. silver per ton, with 60% lead and 5.5% copper.——Work was resumed last week at the Stemwinder mine, on Columbia moun

[illegible] at 2450 ft. [illegible] to develop the ore body at greater depth. [illegible] A shipment of ore from [illegible] Savoy mine on Seven Thirty mountain [illegible] ment of 1.50 oz. gold and 32 oz. silver per ton. A Rolker is operating [illegible] gold and zinc. A vein of ore two feet wide has been found in the bottom of the [illegible] shaft on the Jones Bros. property in the Ohio district. Tests show values of $60 per ton in gold and silver. The Lead Creek M. Co. operating on Lincoln hill, advanced the lower adit 225 ft. It will be necessary to drive 300 ft. to [illegible] the Nelson vein is encountered. The Hidden Treasure mine is being developed and occasional shipments of ore are being made. The Lincoln adit is expected to tap the 500 ft. station of the Victoria City shaft within the next 10 ft. F. A. Maxwell is in charge of the work. Heavy shipments of lead and zinc concentrate are being made from the Pelican mill. The lead product which carries silver is worth $60 per ton. A discovery is reported at the Smuggler mine, on Brown mountain, where a 10 in. streak of galena was opened in the breast of adit No. 2, that mills $64 per ton in silver and lead. J. R. Sapp is manager.

Georgetown, December 12.

GILPIN COUNTY

The Frontenac Con. Mines, Ltd., owns the Frontenac and Addudel mines, having the Addudel vein, on which there are 20,000 ft. of underground work on the two properties. It is claimed there is a big tonnage of ore exposed by those workings, the grade of which is $6 to $12 per ton, the metals being gold, silver, lead and zinc. The group was cut by the Newhouse tunnel at a depth of 2000 ft. on the dip of the vein. The Addudel and Frontenac workings extend only to the seventh level, leaving vast unexplored ground between that and the level of the Newhouse tunnel. Henry P. Lowe and Sydney B. Tyler are manager and engineer, respectively, and under their direction a 250-ton mill is being built on the site of the Penn mill at Black Hawk. It is being equipped with a crusher, rolls, classifiers, tube mills, concentrating tables, and slimers. Systematic tests, carried on more than a year, convince these operators that with the mill being constructed it will be possible to recover 80 to 90% of the gold, 60 to 70% of the silver, 75% of the lead and copper, and practically all of the zinc. It will be noted that the plan of this mill represents a radical departure from the old Gilpin county mill practice.

LAKE COUNTY

The lessees of the Lime mine, on California gulch, have a contract to ship zinc carbonate ore to the Excelsior zinc works in Missouri. The terms of the contract allow the shipment of ore running as low as 20% zinc; this is a concession not heretofore given, 25% having been previously the minimum. It is predicted that other zinc buyers may meet this reduction in grade of ore that will be received. ——The ore shippers on Breece hill are the Highland Mary, Penn, and Big Six; operators of the Bertha, Curran, Grand Prize, President, and Little Galesburg are active in exploring for ore.— The Clear Grit, on Iowa gulch, managed by C. J. Moore, has a pumping plant, and by keeping the water out, the shaft sinking can progress. Within a month it is calculated that the first contact will be cut by the shaft. When that point is reached a station is to be cut, and a level driven to the Helena ore-shoot. —The lower levels of the Helena mine, Iowa gulch, are filled with water, and the pumping station is also submerged to a depth of 110 ft. Divers who succeeded in starting submerged pumps in the Smuggler mine at Aspen were here to start the Helena pumps, but were unable to reach them, on account of an obstruction in the shaft. George Cramer, a lessee at the Waterloo shaft, Carbonate hill, is making daily a shipment of 30 tons of zinc carbonate ore which exceeds 30%. The ore is being mined on the 450-ft. level. ——About the first of the year some of the leases on Leadville mines will terminate and the properties will then be operated on company account; many other leases will be renewed at this time. The opportunity for the lessee of ordinary means has been to mine bodies of ore over [illegible] ...ceed a certain [illegible] ...ained is [illegible] ...ore [illegible] ...ntracts [illegible] ...ported. The Coronet [illegible] ...the average value of [illegible] ...per ton. Close to 1000 tons of this class of ore [illegible] ...being mined in the district.

SAN JUAN COUNTY

A shoot of lead-iron-zinc sulphide ore has been opened on the third level of the Ledge mine, said to be 150 ft. long, 5 to 20 ft. wide. About 100 tons of this ore is being concentrated per day, by which two products are made—one running 50% lead, the other 40% zinc. Later the mill will have reached its normal capacity, which is 200 tons per day. The mine is between Silverton and Red mountain.

The North Star mill at Silverton is operating part time. The Iowa mill is being operated on ore produced by the Iowa Tiger Leasing Co., concentrating 100 tons per day, and shipping 20 cars per month of lead concentrate.

SAN MIGUEL COUNTY

The November production of this county showed an increase over previous months. The total for 1910 is estimated at $3,344,000. The mining of ore containing vanadium has contributed considerably to the county's industry.

Map of Southwestern Colorado.

SUMMIT COUNTY

William Jacobs, of Georgetown, who has been developing the Star group in Peru camp the past year, recently opened a narrow vein of ore, samples from which assayed 800 oz. silver per ton. The ore contains silver glance, copper, and bismuth.— The Wilson, Breen, and Michigan mines are the most active properties at Kokomo. The Wilson has a force of 90 men.

TELLER COUNTY

(Special Correspondence.)—Stratton's Independence, Ltd., for the first half of the fiscal year (December estimated), shipped 9386.44 tons of ore of the gross value of $228,900, and milled 50,353 tons of low-grade ore having a gross value of $150,000. The mill, which was recently enlarged to give it a capacity of 9000 tons per month, is successfully treating sulpho-telluride ore grading as low as $3 per ton, and is earning 10% on the entire capital of the company. The process consists of crushing and concentrating in cyanide solution, the sand and slime tailing being cyanided separately. The plant has been in operation since March 1908. This company paid on November 30, dividend No. 4, of $60,000, or 6c. per share free of income tax. Philip Argall & Sons are consulting engineers and acting managers for the company.

Victor, December 17.

(Special Correspondence.)—The Cresson Con. Gold M.

Co., of Chicago, owns and operates the Cresson mine, situated between Battle mountain and Raven hill, Cripple Creek district. The mine is opened by a 1200-ft. two-compartment shaft. Ore is being mined on the 400, 500, 700, and 1000-ft. levels, and the ore-shoot is being opened on the 1200-ft. level, which is the water-level at present. The Cresson is within the basin which is being drained by the Roosevelt tunnel. In 1909 this mine ranked third, in tonnage of ore produced, among the properties of the district. The shaft-house and plant were destroyed by fire April 11, 1910, and were replaced and ready for use by July 11. Richard Roelofs, the manager, took charge four years ago.

Cripple Creek, December 9.

Vanatta and associates, lessees on the fifth level of the Ajax, Battle mountain, recently opened a body of ore 11 ft. wide, a 5-in. streak within it assaying 27 oz. gold per ton. A shipment of the rich ore was made. Fogleman & Vaughan, having a lease on a block of ground in the same mine, lately shipped two cars of ore which sampled about $100 per ton. The 25 sets of leases on the Ajax, nearly all of which are profitable, yield a tonnage of ore that makes this property one of the large producers of Cripple Creek district.

IDAHO

BOISE COUNTY

(Special Correspondence.)—The Gold Hill & Iowa Mines Co., operating its mine and mill at Quartzburg, has been milling ore from a new orebody found on the 500-ft. level during the past month. Lessees working on the Confederate claim of this group milled ore which yielded $30 per ton by amalgamation in a Lane mill. The sub-station on the company's power-line recently burned down, and pending the installation of a new one the water in the shaft rose nearly to the 400-ft. level, as electric power was depended on for pumping. E. E. Carter, the manager, states that extensive development is to be carried out next year.

Quartzburg, December 17.

KANSAS

CHEROKEE COUNTY

The old Lawton camp northwest of Galena is being revived under the management of Walter Ragland and associates. A centrifugal pump has been installed to unwater the ground, power for which is supplied by the electric company, so that work can be started at once. It was well prospected by drilling many years ago and was considered worth developing.——Joe Fahlenbach, manager for the Clermont company, operating on Shoal creek, south of Galena, is planning deeper development. The land belonging to the company has been tested to a depth of 300 ft. and the levels from 140 to 300 ft. were found to be mineralized.——Franklin Playter, who drained the Southside tract and leased 80 acres of it, has let a contract for about 2000 ft. of drilling, to determine the condition of the 250-ft. level where ore is said to exist.——The new Petersburg mill, in the Quawpaw camp, is modeled after the Eastman Investment mill, which proved a success in treating the difficult ore in that camp. This ore requires different treatment from the Joplin ore, hence the need of different equipment. The mill is equipped for complete sizing, has six sets of cleaner jigs, but no rougher jigs. There is also a department in which the fine is well taken care of. The mill has a rated capacity of 400 tons, and it is expected to be in operation by January 1.——The Tlawaugh company opened several veins of ore while sinking. They vary from 6 to 8 inches in thickness. There is a mill on the lease, and this mine is classed among the better properties of Galena camp.——The Hella company, at Cave Springs, sank a shaft into a new deposit, finding ore running 5 to 40%. An 8-ft. face of ore is in evidence in a drift that was run from the 130-ft. station.——The Homestake company, at Peacock, has purchased the Cincinnati mill and will move it to the lease. A new body of ore was discovered in the Homestake and some of the ore was tried out on hand-jigs.

Galena, December 10.

MISSOURI

NEWTON COUNTY

(Special Correspondence.)—The Spring City camp is more active than at any time for a year. A new mill has just been completed and put in operation by Creech & Co. on the site of the old Delta mine. They have had this mine under development for some time. The old Delta company abandoned the mine and removed the mill. Creech & Co., after cutting new ground, found ore consisting of calamine and lead.——Arthur Scott is sinking a shaft on the Craycroft land on which excellent ore was found at 180 ft. by drilling. The formation here is the same as that of the Delta. The ore occurs beneath a cap-rock of limestone.——The Alpha, managed by Adam Scott, is operating after an idle period. This is the first producer in the camp and has made a good record. The mill was recently re-equipped as a concentrating plant and will now treat the ore direct from the mine. The ore runs about 10%.——The U. G. Wilson company has the Ohio Valley mill, which is being overhauled and put in order to operate on ore from the Wilson lease. A derrick and hopper are being built and a tramway will be built from the new shaft to the mill. The Ohio shaft is also being reopened.——The La Plata is being reopened and equipped with a derrick, ore-hopper, crusher, hand-jigs, and hoister, by Kaufman & Patterson.

Granby, December 17.

MONTANA

FERGUS COUNTY

(Special Correspondence.)—The New Year Gold Mines Co. has sold its mine and cyanide plant, situated near Maiden, Judith basin, to the Reingold Mining Co. of Chicago. Joseph Meredith, who has been superintendent of the property for ten years, has tendered his resignation to take effect December 31.

Lewistown, December 18.

NEVADA

CLARK COUNTY

Lessees of the Chief of Hills mine have made a run of 75 tons of their ore at the Cyrus Noble mill, at Searchlight, recovering over $3000 as the result. The Yellow Pine M. Co. is erecting a concentrator at Goodsprings. Shipments from the latter camp amount to 20 tons per day, the ore being mostly zinc.

NYE COUNTY

The Rawhide Coalition Co., directors of which are E. W. King, H. R. King, J. H. Barrett, M. Sheeline, and S. A. James, has decided to purchase the Rawhide Queen mill for treating the ore of the Coalition company at Rawhide.

STOREY COUNTY

Last week's production of the three principal north end mines on the Comstock were: Ophir, $10,785.75; Con. Virginia, $517.40; Mexican, $1834. The 185 mine cars from the Ophir, taken from the 2100-ft. level, averaged $56.87 per ton, and 22 cars from the 2300-ft. level averaged $11.98. The ore from the Con Virginia, 85 cars, was mined on the 1800-ft. stope and ran $6.08 per ton. The Mexican's tonnage consisted of 27 cars from the 2200-ft. level, running $24.04; 47 cars from the 2300, averaging $14; 60 cars from the 2350-ft. level $5.75; 15 cars from the 2500, $12.17 per ton. The principal development in the Ophir consists of sinking a 3-compartment winze from the 2200-ft. level. It has reached a depth of 25 ft. below the 2400-ft. station, and is to be sunk to the 2500-ft. level. Work of driving and stoping is in progress from the 2300-ft. station of this winze.——The Charles Butters, Co., Ltd., has leased its concentrating mill and cyanide plant in Six-Mile canyon, below Virginia City, to Joseph Dietrich and Hahnewald Bros. of Leadville, Colo., who have a lease on the upper workings of the Chollar and Potosi mines. The lessees began operating the concentrator the next day after the lease was signed, and the cyanide plant is to be started as soon as there is a sufficient accumulation of slime from the concentrators. They anticipate milling 150 tons of ore per day. The former millmen are retained.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence.)—The Ernestine M. Co. treated 584 tons of ore for the week ended December 3, and a statement therefrom 6000 oz. of gold and silver bullion, and 60 sacks of concentrate.——The Socorro Mines Co. milled 900 tons of ore for the week, producing concentrate on the tables, and a gold and silver precipitate in the cyanide plant. A large tonnage of the ore milled was incidental to development work.——The Gold Dust Mines Co. is active in establishing a camp. A storehouse, boarding house, and blacksmith shop are nearly finished. In the mine driving is in progress from the crosscut adit.——The Mogollon Gold & Copper Co. is installing a steam hoist, and three tanks are being set up for the storage of fuel oil for steam boilers. A machine shop and assay office are being built. At the same time mine development is in progress.——Operators of the Deadwood mines have driven a crosscut on the 500-ft. level to the Last Chance vein. Progress is being made building the mill.——The Treasure Mining & Reduction Co. has teams at work hauling ore from the mine to the mill, most of the ore being taken from the ore body recently discovered on the foot wall of the lode.

Mogollon, December 4.

(Special Correspondence.)—Forty men are employed at the Deadwood mines. The mill is nearly finished, the pipe line for water supply is all laid, and the telephone line from Mogollon to the mine is being established.——The week's tonnage of ore milled by the Ernestine M. Co. was 679, the product having been 56 sacks of concentrate, and 6926 oz. of silver and gold bullion. Some of the richest ore is being taken from the eleventh level west, which contains free gold and native silver.——At the Socorro mill 800 tons of ore was treated for the week, and creditable shipments of bullion and concentrate were made.——Two shifts of miners are at work in the Gold Dust mines, and driving is in progress both east and west from the crosscut, the headings being on a 4-ft. vein.—The first and third levels are being driven south in the property of the Enterprise M. Co.——Work has been started by contractors on the north drift of the Admiral Dewey claim, situated on the Mother Lode.——At no period in its history has the district received such intelligent development as at present. The discovery of new ore zones and the proving of known bodies at greater depths is of weekly occurrence, and it would now seem that production will be doubled the coming year.

Mogollon, December 10.

OREGON

BAKER COUNTY

The United States Smelting, Refining & Mining Co. has bonded the Rainbow mine at $1,050,000, having four months in which to examine the property and decide as to taking up the bond. The conditions require the payment of $250,000 cash if acceptance is made at that time. The Rainbow is a gold mine, belonging to the Commercial M. Co. of Portland, and is situated in Mormon basin, 30 miles southwest of Huntington. The mine and mill have been steadily operating for six years.

WASHINGTON

FERRY COUNTY

The Knob Hill M. Co., having a lease and bond on the Knob hill claims at the forks of Eureka gulch, Republic, is believed to have the northern extension of the Lone Pine-Surprise lode. Recent driving on the vein demonstrated that the ore has an average width of 2 ft., and that it is 7 ft. wide at the present face of the drift. Samples taken across the face on three consecutive days assayed $174, $120, and $216, respectively. Shipments from the mine amount to one car per week, the smelter returns running $1800 to $4700 net per car. The company's manager is J. W. Lloyd, who is having another adit level driven which is to cut the orebodies at greater depth. The Knob Hill formerly belonged to J. Browne, who bonded it to this company.

WYOMING

ALBANY COUNTY

(Special Correspondence.)—The Rambler Copper & Platinum Co., operating at Holmes, 30 miles west of Laramie in Medicine Bow range, has made some changes in its mill whereby it is expected soon to be treating 150 tons of ore with a resultant production of about 1000 oz. of platinum concentrate per day. A. C. Dart is general manager for this company.

Holmes, December 15.

CANADA

BRITISH COLUMBIA

(Special Correspondence.)—Work on the Mayflower lease in the South Belt shows ore in the main vein assaying $50 per ton. The Nickel Plate lessees continue regular shipments to Trail and expect to work all winter.——The Le Roi No. 2, Ltd., for October produced 2250 tons of ore and 134 tons of concentrate, which returned $25,756. The estimated expenditure was $8000 on development, $15,000 on ore production, and $1250 in milling, a total of $19,750. Work in the principal workings was advanced 314 ft.——The ore shipments from Rossland district for the week ended November 26 were: Centre Star, 4182 tons; Le Roi No. 2, Ltd. (part concentrated), 342; Le Roi, 315; Nickel Plate, 29 tons.

Rossland, December 3.

(Special Correspondence.)—The Granby Con. M. S. & P. Co. has announced a dividend of $1 per share, amounting to $150,000 on its outstanding stock. This makes a total of $3,928,630 paid in dividends to date. During October this company shipped 1,154,234 lb. copper. Eight furnaces and four converters are in operation. Last week the shipments of blister copper amounted to 348,000 lb. The main vein has been cut in the tunnel at the No. 7 mine of the Consolidated company, and a new and lower adit will be driven. A crushing plant is to be installed at the mine. Diamond drill work is being done on the Alma and Fairplay claims of the Snowshoe group.——The ore shipments from Phoenix district for the week ended December 3 were as follows: Granby Mines, 18,354 tons; Jackpot, 400; Mother Lode, 7784; No. 7, 37; Rawhide, 4000; Snowshoe, 3833 tons.

Phoenix, December 10.

(Special Correspondence.)—It is reported that the Standard mine, near Silverton, is about to change hands, on a basis of about $400,000. The lode on this property is exposed in six adits, and a seventh is being driven. The ore carries 70% lead and about 100 oz. silver per ton. The ore mined is being shipped to Trail.——The Crows Nest Pass Coal Co. has closed down some of its Coal creek mines and will reduce the output to about 3000 tons per day. The total tonnage of all of the company's mines has been averaging over 6000 tons per day.——The shipments of ore and concentrate from this district for the week ended December 3 were as follows: Buffalo, 2 tons; Fisher Maiden, 11; Flint, 20; Hope, 30; Richmond Eureka, 32; St. Eugene (concentrated), 138; Silver Cup, 28; Sullivan, 580; Utica, 19 tons.

Nelson, December 10.

The British Columbia Copper Co., under the management of J. E. McAllister, operated three copper furnaces during the month of November, smelting an average of 2000 tons per day. The ore supply is derived from the company's Mother Lode mine, near Greenwood, and from the mines of the New Dominion Copper Co., situated mainly in the Phoenix district. The B. C. Copper Co. owns 64% of the shares of the New Dominion company, and for several months has exercised control over the latter's mines. The ores of the Mother Lode mine carry enough gold, when credited to copper production, to enable the B. C. company to produce copper and deliver it in New York at about 8c. per pound.

MEXICO

HIDALGO

The La Reina company has acquired the adjoining San Pablo property of 24 *pertenencias*, taking in part of an important lode of the Pachuca district.

Book Reviews

Any of the books noticed in this column are for sale by or can be procured from, the MINING AND SCIENTIFIC PRESS.

A GUIDE TO TECHNICAL WRITING. By T. A. Rickard. Second edition. Pp. 172. Index. *Mining and Scientific Press*, San Francisco, *The Mining Magazine*, London, 1910. Price $1.

The wide interest aroused by the first edition of this book has encouraged Mr. Rickard to prepare a second. In doing so he has taken advantage of the opportunity to revise the text thoroughly and to add much new matter, including his paper on 'Standardization of English in Technical Literature' that provoked so lively a discussion when read before the Institution of Mining and Metallurgy last May. Mr. Rickard writes vigorously and with the energy of a reformer who has campaigned with Mr. Heney. He puts things strikingly and provokes the reader to search that he may find errors in the rules laid down. All this is excellent, since, as he well says, "Whether my views prove acceptable or not is a small matter; my aim in addressing you is * * * to direct your attention to the intelligent use of words in technical writing." This he has certainly done. Since he read at Denver in 1901 his 'Plea for Greater Simplicity in the Language of Science' there has been much searching of dictionaries, by Mr. Rickard's readers as well as by him. Probably few will accept all his statements and rules, but all who have read his various articles on technical writing have thereafter written more carefully. "The attempt to state useful rules may read like an effort to establish irrefragable laws," he says, to which I would add that it certainly does, but to accept the rules as absolute is to mistake the author's purpose. He puts the whole thing nicely in the preface: "Reformers do not wait until they receive official appointment. Such as I have I give. I write as a scribe, without authority, except in so far as the members of my old profession will concede it to me from the nature of my present occupation; I speak as a student, not a master; as an amateur who has become a professional, but not a professor."

The book is most attractively written and is thoroughly interesting. It is at the same time informing and is the best practical guide to correct writing available to engineers. That in the main Mr. Rickard's suggestions are good, is evidenced by the extent to which they have been adopted since the appearance of the first edition of the book. The official action of the Chemical, Metallurgical & Mining Society of South Africa in adopting his more important recommendations indicates that engineers are willing and anxious to write well when shown how. The hint might well be taken by those who plan courses of study in engineering schools. It is as great a handicap to a graduate of an engineering school to have been given poor or no instruction in his native tongue as to have been imperfectly taught in chemistry or mathematics. H. F. B.

THE AMERICAN RED CROSS ABRIDGED TEXT-BOOK ON FIRST AID. By Charles Lynch. Pocket size. Pp. 183. Ill., index. P. Blakiston's Son & Co., Philadelphia, 1910. Price 30 cents.

This little volume has been prepared with a view to educating the public in rendering 'first aid' to the injured, and covers a wide range. Accidents occur all around us daily, in the city streets and buildings, on the farm, in the mines and metallurgical works. The book teaches how to bandage injuries, to administer stimulants, to treat persons shocked by electric currents, to carry an injured person, and many other things calculated to temporarily aid the victims of accidents until medical assistance can be secured. It is a very valuable and humane little work and should be available at every mine.

THE MYSTERY OF BONANZA TRAIL. By Frank J. Arkins. Pp. 128. Ill. The General Publishing Syndicate, Denver. Price $1.

This is a story of mining, such as is seldom read in popular magazines. The author treats his subject intelligently for the most part, and works it up to a successful and dramatic climax. The story is woven around a group of rich mines beset by almost interminable litigation over apex control and extralateral rights. The legal battle waged is certainly complicated enough to suit the most exacting, though no worse than has been fought in a dozen Western camps. The scene may well have been in the San Juan mountains of Colorado. The little story is full of life, information, and entertainment.

GOLDFIELD CONSOLIDATED FOR NOVEMBER

The following preliminary report of the operation of the Goldfield Consolidated Mines for November 1910 has just been issued by the general manager, J. R. Finlay:

TONNAGE PRODUCED

	Dry tons.	Average oz. per ton.
Combination	4,778	0.89
Mohawk	7,695	0.87
Red Top	4,237	1.03
Jumbo: Milling ore	8,031	2.38
Shipping ore	215	35.11
Total	24,956	1.68

The gross value to be credited to the various mines is as follows: Combination, $87,900; Mohawk, $138,350; Red Top, $90,200; Jumbo (milling ore), $395,000; Jumbo (shipping ore), $156,000; total, $867,450.

The performance of the mill was as follows: dry tons milled, 24,741; average value per ton, $28.76; total value, $711,450; loss in tailing, $55,236; value realized, $656,214; percentage extracted, 92.24.

EXPENSES

	Amount.	Average per ton.
General:		
Bullion tax, income tax, and marketing bullion	$23,500	
Administration, etc.	18,000	
	$41,500	$1.66
Mining	88,000	3.53
Marketing high-grade ore	13,500	0.54
Transportation	3,000	0.12
Milling:		
Milling and cyaniding.....$57,500		
Marketing concentrate res. 16,500		
	$74,000	2.99
Construction	4,600	0.19
Net cost	$224,600	$9.00
Loss in tailing	55,236	2.21
Total costs and losses	$279,836	$11.21

Profit per ton, $23.55; total value of ore per ton, $34.76; total profit for month, $587,614; percentage of profit, 67.74.

The manager says: "The long progress of construction is in process of winding up. We may now count on economies in power and supplies. The electric storage-battery plant is in successful operation, and it is expected to effect a saving of $2500 per month. The new assay office is so far along that the process of moving in will begin immediately. The new refinery at the mill has been partly tried out and we are confident of saving $5000 per month by its use. Only the delayed arrival of some material has prevented its final completion before this. The new heating plant at the mill has apparently already paid for itself by the improvement it has accomplished in precipitation. The new compressor for the mill has been greatly delayed and will not be installed before January 1."

The advance made in the various mines for the month was as follows: Combination, 419 ft.; Mohawk; 1264; Red Top and Laguna, 857; Clermont, 1125; total, 3665.

The only ore of consequence opened on new levels during the month was in course of development on the 1000-ft. level of the Clermont. This produced 509 tons of ore that averaged by mine assays 5.01 oz. per ton.

Personal

[illegible]

Max. R. Lamb is at Lima, Peru.

[illegible] is at Bear, Nevada.

W. W. Mein has been in San Francisco.

W. J. Loring is expected in San Francisco.

A. F. Mayo was in San Francisco last week.

C. Newton Newton was in San Francisco this week.

Corey C. Brayton was in San Francisco last week.

Fabi Dussinger has returned from Mexico and is at Amos, Nevada.

Gustavo Calvani has returned to San Francisco from Nicaragua.

Lionel Lindsay is at Alamos, Mexico, for the Pacific S. R. & M. company.

Norman C. Stines is at St. Petersburg for the Russian Mining Corporation.

Victor G. Hills is examining a tungsten mine in Halifax county, Nova Scotia.

M. Eissler has been at St. Petersburg recently in connection with negotiations regarding his concession in the Trans-Baikal region.

Samuel J. Weis has gone to Axim, Gold Coast Colony, West Africa, to supervise dredging for the Ancoba Exploration & Dredging Co., Limited.

Walter Currie, consulting engineer for Willoughby's Con. Co., Ltd., Bulawayo, Rhodesia, was in San Francisco, and has gone to Deadwood, South Dakota.

Joseph Meredith, for ten years superintendent of the New Year mine and mill near Lewistown, Montana, has resigned on account of the sale of the property.

OBITUARY

Stewart Watt, vice president and superintendent of the Watt Mining Car Wheel Co., died at his residence at Barnesville, Ohio, December 10, at the age of 64. He was ill but a few days with bronchial pneumonia. Mr. Watt was, with his brother who died several years ago, the joint inventor of the first self-oiling mine-car wheel, and for the last thirty-five years has been actively engaged in the manufacture of mine-car wheels. He first operated a foundry in 1863.

DECLINE IN FOREIGN VISIBLE COPPER

The decrease of 1,072,960 lb. in the foreign visible supply of copper in the two weeks ended December 1, makes a total decrease of 60,995,200 lb. since March 1. Foreign stocks of 193,155,140 lb. are now at lowest point since August 1909, when they amounted to 171,492,160. The high point was 254,150,400 lb. in March of this year.

The United States surplus, foreign visible supply, and total of the two since January 1, 1909, in pounds, as tabulated by the *Boston News Bureau*, is given below.

	U. S. surplus.	Foreign visible supply.	World's surplus.
January, 1909	122,357,266	124,716,480	247,073,746
July, 1909	154,858,061	150,928,960	305,787,021
January, 1910	141,766,111	244,205,800	385,970,911
February	98,463,339	248,236,800	346,700,139
March	107,187,992	254,150,400	361,338,392
April	123,824,874	249,607,680	373,432,554
May	141,874,159	246,863,680	388,737,839
June	160,315,973	239,265,600	399,581,573
July	168,276,017	232,863,680	401,139,697
August	170,640,678	222,295,360	392,936,038
September	168,881,881	218,415,680	387,297,561
October	148,793,714	210,472,640	359,266,354
November	139,261,914	198,065,280	339,327,194
December 1		193,155,140	

Market Reports

LOCAL METAL PRICES

San Francisco, December 9.

Antimony	12–13c	Quicksilver, flask	44½–46
Bluestone, 1b. copper	10½–11c	Tin	41–42c
Pig Lead	4.75–5.00	Spelter	7.00–7.25
Zinc dust, 100-lb. casks, per 100 lb., small lots 6.50–7.00, large lots 6.00–6.50			

METAL PRICES

By wire from New York.

Average daily prices in cents per pound.

Date	Electrolytic Copper	Lead	Spelter	Silver, per oz.
Dec. 15	12.67	4.30	5.68	53⅝
" 16	12.57	4.30	5.67	53⅝
" 17	12.57	4.30	5.40	53⅝
" 18	Sunday.		No market	
" 19	12.57	4.30	5.52	53⅝
" 20	12.67	4.30	5.52	53⅝
" 21	12.57	4.30	5.48	53⅝

ANGLO-AMERICAN SHARES

Cabled from London.

	Dec. 15. £ s. d.	Dec. 22. £ s. d.
Camp Bird	1 11 4½	1 12 6
El Oro	1 6 0	1 6 3
Esperanza	1 17 8	1 17 6
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 9	0 6 9
Mexico Mines	7 15 0	7 17 6
Tomboy	0 15 7½ ex div.	0 16 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Dec. 22.		Closing prices, Dec. 22.
Adventure	$ 6½	Mohawk	$ 45
Allouez	39	North Butte	28⅞
Atlantic	4 5/8	Old Dominion	37½
Calumet & Arizona	48	Osceola	125
Calumet & Hecla	750	Parrot	11½
Centennial	18¼	Santa Fe	1¼
Copper Range	68⅛	Shannon	11⅛
Daly West	3¼	Superior & Pittsburg	13¾
Franklin	9	Tamarack	52
Granby	38⅜	Trinity	4½
Greene-Cananea, ctf	65⅝	Utah Con.	13
Isle Royale	16½	Victoria	3¼
La Salle	7	Winona	8½
Mass. Copper	7¼	Wolverine	115

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, December 22.

Atlanta	$ .14	Mayflower	$ .6
Belmont	4.45	Midway	.17
Booth	.8	Montana Tonopah	.82
Columbia Mtn.	.3	Nevada Hills	2.20
Combination Fraction	.17	Pittsburg Silver Peak	.10
Fairview Eagle	.35	Rawhide Coalition	.4
Florence	1.40	Rawhide Queen	—
Goldfield Con.	8.50	Round Mountain	.39
Gold Kewenas	.6	Silver Pick	.5
Great Bend	.2	St. Ives	.16
Jim Butler	.25	Tonopah Extension	1.00
Jumbo Extension	.25	Tonopah of Nevada	8.12
MacNamara	.19	West End	.54

(By courtesy of San Francisco Stock Exchange.)

In order to perpetuate the business of Camp Bird Limited the directors, in 1909, took an option on the Santa Gertrudis mine at Pachuca, Mexico. This option was taken up. The Santa Gertrudis Co. was registered on December 31, 1909, with a capital of 1,275,000 shares of £1 each. The holding of Camp Bird Limited in the Santa Gertrudis Co., Limited is 1,155,815 shares. W. J. Cox was appointed advisory engineer to the Santa Gertrudis Co. A report states that recent development in the Santa Gertrudis has cut the vein on the eighteenth level, where the vein is 16 ft. wide, of which 8 ft. assays to the value of $20 gold. A new mill of 600 tons daily capacity is being built.

REMOVING AIR FROM SUCTION AND PRESSURE LINES

By Oskar Nagel

The removal of air from pockets in suction and pressure lines is an important problem, especially in cases where the pipe lines, on account of obstruction, have to be carried up and down. An excellent appliance for removing such air is the Koerting water-jet primer (Fig. 1), which

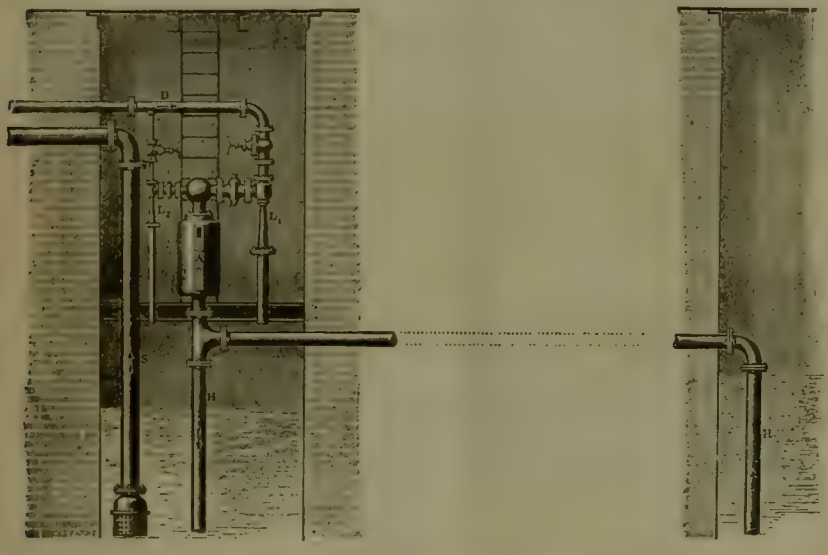


Fig. 1. Koerting Water-Jet Primer.

is successfully used for priming siphon pipes, centrifugal pumps, and long suction pipes of piston pumps. In the cut shown, A is the air vessel, D the water-pressure pipe, H the siphon pipe, and L_1 and L_2 the water-jet primers. As water is always at disposal, in pumping stations the application of these primers is a very convenient matter. They

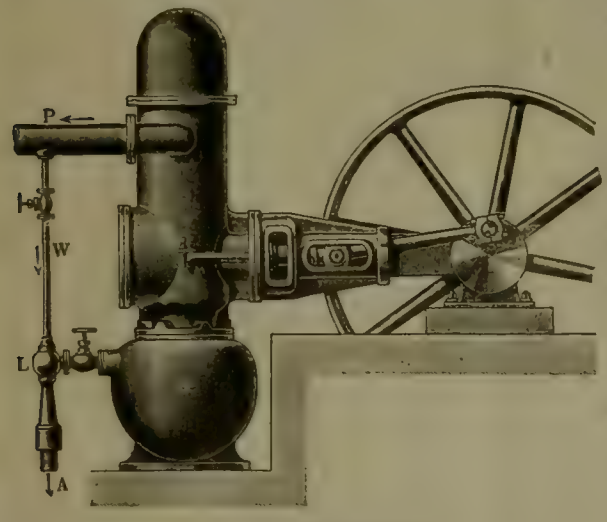


Fig. 2. Exhauster and Engine.

should be placed at the highest point in the piping, which has to be evacuated and one or more exhausters connected to the primer. When using two instruments they should be of different capacities, the larger one being used to fill the pipe-line or system when starting, and the smaller one for continuously evacuating the air vessel which is equipped with indicator-glass to show the rising and falling of the water-level. If the volume of the system to be evacuated is not large, usually only one exhauster is used for filling as well as for continuously evacuating. In such cases the evacuating is done intermittently, and it is advisable to make the air vessel large enough. Fig. 2 shows the exhauster connected to the engine. L is the water-jet primer, P the pressure pipe, S the suction air vessel, and W the water-pressure pipe for primer.

These primers work satisfactorily when only using 30-ft. water-pressure, and they overcome a suction up to 25 ft. The instruments have to be installed always at the highest place. When installed with a centrifugal pump, the discharge pipe of the centrifugal pump has to be equipped with a gate-valve which can be closed vacuum-tight to enable the apparatus to form a vacuum. To start, open the water-valve and then air-cock; to stop, reverse the above operation. When using water-pressure under 60 ft., the discharge pipes of the primers have to be water-sealed. An automatic water-jet primer is also frequently used. The jet apparatus is installed inside of the vessel, and the pressure water is started automatically by a float when the water level falls, evacuating until the water has risen to the proper height; then the water supply is shut off automatically by means of a float-actuated water-pressure valve.

In this connection, a few words on air-valves may be of interest. The Schutte automatic relief-valve is available for air-bound water mains. This valve will open and admit air when a break occurs in the main, so that the water will discharge freely, and it will discharge the air when under pressure, and close as soon as water reaches the float. The floats are made solid, respectively of aluminum and lead, so that the valve is suitable for any pressure.

COMMERCIAL PARAGRAPHS

The Jeanesville Iron Works Co. calls attention to an error in its advertisement on the front cover of the *Mining and Scientific Press* of December 3. This advertisement describes a 5-inch six-stage Jeanesville turbine pump having a capacity of 700 gal. per minute, while the illustration accompanying the same shows a 15-inch four-stage Jeanesville turbine pump having a capacity of 4200 gal. per minute. No blame is attached to the publication for this error, copy having been followed exactly. The 5-inch six-stage Jeanesville turbine pump which is described will be illustrated in the Jeanesville advertisement to appear on page 26 of the *Mining and Scientific Press* of January 7.

The Union Iron Works Co., San Francisco, will on January 1, 1911, move its city office from 320 Market street to the Insurance building at the corner of Battery and California streets. P. C. Jurs is manager of the mining machinery department.

The Revere Rubber Co., of Boston, through its New York store, has been awarded the contract for the suction hose to be used by the Government in raising the battleship *Maine*, in Havana Harbor. The award, coming after a keen competition, is naturally looked upon with considerable pride.

The Westinghouse Diary for 1911 is out. It is issued by the Westinghouse Electric & Mfg. Co., and is the same neat vest pocket memorandum and collection of useful informations as were the previous editions.

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INDEX TO ADVERTISERS, PAGE 44. PROFESSIONAL DIRECTORY, 6 26. BUYERS' DIRECTORY, PAGE 42.

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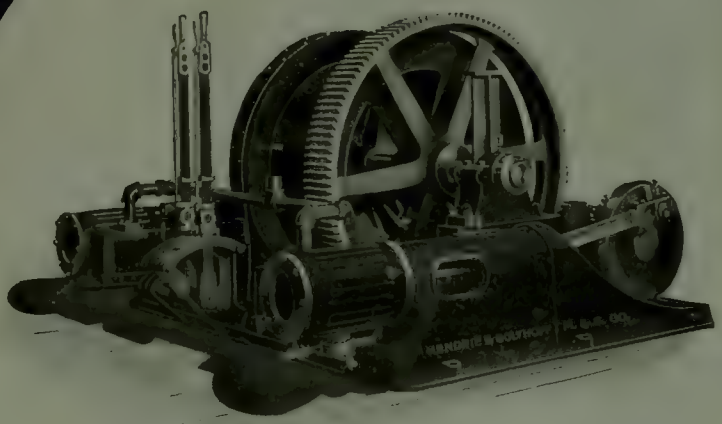

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EDITORIAL

TIN is now being produced on a commercial scale near El Paso, Texas, as related in our news columns. It is to be hoped that continued development will show the orebodies there to be large and persistent.

FIFTY YEARS AGO, when J. D. Whitney was candidate for the position of State Geologist of California, a cynical friend wrote him: "Keep your honesty out of sight or you are a gone coon." There have been times since when candidates for the position of State Mineralogist might have taken this advice seriously, but not so now. We are glad to believe that the appointment about to be made to this important position will be well considered, and we hope a good man may be chosen. A number of excellent suggestions have been made. Among those mentioned are Messrs. Ross E. Browne, W. C. Mendenhall, W. H. Storms, E. H. Benjamin, R. P. McLaughlin, P. C. DuBois, W. B. Winston, and others. From this list it should be possible to outfit several bureaus excellently.

SMELTING has been resumed at the Coram, California, plant of the Balaklala Consolidated Copper Company, where the Cottrell process of fume precipitation is on trial. Various difficulties have naturally been found in starting the plant, and the farmers, becoming impatient, recently forced the closing down of the furnace. At that time approximately 90 per cent of the solid matter in the smoke was being precipitated and good progress in experimental work was being made. New electrodes have now been put in and one furnace was blown in December 28. In the Cottrell process an electric current of extremely high voltage is used, and it is not easy to secure an even distribution of current. With better knowledge of insulating material and more experience in operation, it is altogether likely that complete success will reward the efforts of the engineers in charge. Much has already been accomplished.

DUST in the mines and in dry-crushing plants is not only a nuisance, but often a source of danger. In coal mines and in flour mills disastrous explosions have resulted from its presence. Rock dust does not involve this danger, but it is injurious to health and destructive to machinery. In our Kalgoorlie letter of December 17 was a report on a recent investigation of the effect of dust on the health of men underground. Unfortunately corresponding studies of dust in dry-crushing plants seem not to have been made. Relatively few plants have

been equipped with machinery for drawing off and settling such dust, and many mills are constantly full of a regular fog of fine rock particles. One of the Leadville mills has the crushing machinery housed in with sheet iron and by means of exhaust fans draws the fine dust to a settling chamber. Doubtless a number of different schemes have been tried, but there is a surprising lack of definite information on the subject. Engineers having experience in building such equipment would do their fellows a service by publishing plans that have proved effective.

RIGHT TO LATERAL SUPPORT of the ground in its natural condition is generally recognized, though in California and some other States this does not extend to support of improvements. The matter recently came up in an interesting way at Otago, New Zealand, in connection with dredging. It is clear that where different companies are dredging adjacent lots considerable ground would be lost if each dredged only up to the point where the surface would remain unbroken along the line. In the case of the Molyneux Hydraulic Dredging Company *v.* the Karaunui Dredging Company, reported in *The Australian Mining Standard*, the ground in dispute amounted to 3½ acres; enough to keep the dredge in question at work for an entire year. It was decided that the right to lateral support was paramount, and in absence of agreement between the companies, the natural batter of the ground must be maintained. In California the question has not arisen because it is customary for two companies by agreement to each work up to the line on the bottom of the pit for half of the distance along the boundary.

The Eight-Hour Law

When the eight-hour law was proposed, various arguments, pro and con, were advanced. Its friends claimed that miners and millmen were being overworked and could no longer endure the strain; that if given the opportunity the men could, and would, do as much in eight hours as they had been accustomed to accomplish in ten. Its opponents declared that the law would result in a direct increase of expense, which in some cases would be prohibitory, that the men would do no more work in an eight-hour shift than they did in eight of the usual ten, and that in some instances they could not possibly do as much. In drilling with machines, for instance, it was contended that it would take as much time to reach the working place and to set up the machines under one schedule as under the other, and that when a round was to be finished and the machines taken down within the eight-hour period, loss of effective working time was inevitable. In mills, smelters, and at hoists an extra crew would be required and expense increased proportionally. The eight-hour law has now been in force for some time in several mining States, and although not much has been said by either side to the controversy, it would be interesting to know whether it has been as satisfactory to the miners as they anticipated. There are many mines rich enough to bear the increased expense of the eight-hour day, but there are those which, already operating on a narrow margin, were unable to continue work without direct loss when the eight-hour day was imposed by legislative act. These mines were closed after making a trial under the new conditions. It was found that the men, contrary to their prediction, failed to accomplish any more in eight hours than they had previously accomplished in the same length of time, and under some conditions they actually did less. Increase of surface force directly increased cost of operation with no compensating advantage whatever, and nothing remained but the choice of closing down or continuing at a loss, with the decision almost invariably in favor of the former, thus forcing men out of work who had been employed steadily for years under conditions which even they admit were not unsatisfactory.

Suppressing a Government Report

Comment on the Utah Consoldiated collapse has been widespread, and much of it beside the point. Essentially the matter simmers down to a difference of opinion between engineers as to how much ore can be recovered from certain old workings. As to the amount and value of the ore that can now be sampled and measured, there is a slight but not important disagreement. The ore that is in the form of pillars, and which was sampled before the stopes were filled, is admittedly large in amount. Just what value is to be assigned to it, the engineers do not agree. In Mr. J. W. Finch's report of last February the two sorts of ore were discriminated, and the estimates made at that time should not have deceived anyone. Since metals are now selling at a lower rate and some ore has been mined, the reserve must be figured at less than he and Mr. J. B. Risque then estimated it. This correction should be easily made and ought not be large. What further correction, if any, should be made for real or supposed inability to recover the pillars, is properly a matter for difference of opinion among engineers familiar with the property. Any estimate of the value of the now inaccessible pillars and blocks of ore is necessarily based upon records of sampling and assaying at the time the stopes were open. Provided that this be clearly stated, and we understand that both Mr. Risque and Mr. Finch so safeguarded themselves, we see no harm in that. To allow nothing for these blocks of ore would be unfair to the property and would fail to safeguard the interests of the individual stockholder. It is as important to know the possibilities of a property, so long as they are reasonably well grounded, as to know the proved facts.

An example of comment that, in our judgment, is harmful is an article appearing in *Mines and Methods* for December. This article contains nothing new with regard to the particular case in point. Instead it opens with a recital of the details of the famous Emma scandal of years ago and follows with the assertion that the case of the Utah Consolidated is similar. After this is a general attack on the Utah

Consolidated, the United States Mining Company, Mr A F Hodson and the United States Geological Survey. We fear our suspicions as to the editor's habit has indulged in mind-reading until it has become a habit. We have no desire to provoke hostile criticism either of company officers or Government performance, though for our own part we prefer to cling rather closely to the technical field, and generally leave to others the discussion of financial matters connected with mines. In the present case there is one criticism in particular that we must not allow to go unchallenged. The implication is made that the long delay in publication of the United States Geological Survey report on the Bingham district was due to pressure exerted by or for the two companies mentioned. In the one case the object to be gained was the unloading of stock at high prices before the Survey maps should show that faulting precluded hope of extension of the ore-bodies. In the other it is suggested that if the report had been promptly published, it would have been impossible for the "very extraordinary" and "seemingly absurd" claim of the United States company to the Kempton orebody to have been allowed by the court. The editor attempts to exonerate Mr J. M. Boutwell and Mr S. F. Emmons personally, but "submits that the suppression of the report demands a rigid investigation by the head of the department." This, we are sure, Mr. George Otis Smith, the Director of the Survey, will be glad to make if there be any evidence of "suppression." The report was delayed, it is true, but not to further private interests. From a long and intimate association with the United States Geological Survey we can state without fear of contradiction, that no one has influence enough to secure the suppression of a report by that Bureau. It has been customary, as is, we believe, entirely proper, when an officer undertakes the study of a district in which litigation is in progress, and where the various parties to the suits give him access to all their confidential maps and data, to agree that no publication shall be made until the particular suits pending are settled. Upon no other terms could a mine manager afford to open his files to the Survey geologists, and without the confidence and help of the mine managers the survey would not be worth making. Whether there was such an agreement in this case we are not informed. If there was, it was proper that the report should be delayed until the suit was ended. Our impression is, however, that in this particular case the delay was due to the inherent difficulties in making the survey, to the fact that it was Mr. Boutwell's first important independent assignment, so that he naturally desired to delay publication until he had had the opportunity to test his conclusions at Park City and elsewhere, and to the usual difficulties in getting any illustrated Government report edited and printed promptly. The last mentioned cause is sufficient in itself to explain much delay. Having suffered from it both as author and reader we feel that to do justice to the subject requires more time and space than is now available. For the present it is sufficient to say that no one need be

[illegible]

New York Stock Market

The general situation in the East remains unchanged. It is true, of course, that some Wall Street houses look for better conditions. The leaders in the financial district have insisted upon keeping on good terms as to temporary though the real demand is that so far as market operations and activity are concerned no buying point as we might call it will induce the public to buy. Brokers have been taking small profits from one another and in some cases at this direction are about exhausted. The curb market has become much demoralized, so much so that the really important traders are seeking some means of coming under the protection of the larger exchange so as to establish a legitimate commission charge and protect the market against bucket shop methods, get-rich-quick schemes and irresponsible traders. The growing importance of the mining securities market and the demoralization of the curb in the matter of commissions and in the reliability of the traders and brokers, has resulted in a large number of the more important mining companies seeking to be admitted to the New York Stock Exchange. Mines Company of America, Chino, and Ray Consolidated are soon to be listed. Tuolumne is to be listed on the Boston Stock Exchange. The stock exchange authorities have unofficially suggested that any of the mining companies able to formulate reports and properly make application for trading privileges, should do so without delay. This move means not only that the outside market has lost the confidence of the public, but also that the officers of the stock exchange have at last unwillingly awakened to the necessity of recognizing mining issues and the public trading in them. Back of this is the further fact that the various restrictions and safeguards being now built up around the railway securities in the form of the Commerce Court, the Inter-State Commerce Commission, and the various State public service commissions, are gradually hedging in the field of railway finance, and while adding greatly to the attractiveness of railway shares as investments, are at the same time eliminating speculative possibilities. It has become necessary to seek some other securities to attract the speculator. If the bars are let down so far that it will be possible for a mining company to secure admission to the Stock Exchange before the mine is out of the speculative stage, trading in these securities should become an important part of the business on the floor. Such development will be altogether to the benefit of the mining industry. Heretofore, mining shares have always been scorned by the members of the New York Stock Exchange and by the New York banks, and such issues as gained admittance have found a forbidding atmosphere in which all activity quickly languished. Even Goldfield Consolidated, when removed from the outside market to the big board, lost a large part of its activity. Trading in this issue now marks a steady campaign of distribution.

The Clancy Process

By J. C. Clancy

*The Clancy process is designed especially for the treatment of refractory ores, in which the gold is associated with chemical compounds and is not susceptible to the action of solvents until the ore has been roasted, or until the gold has been disassociated from the chemical combination by some other method of oxidation. A long search for a suitable solvent for such ores, led, after repeated disappointment, to discovery that urea, in conjunction with cyanate, and electrolysis of the solution, dissolved gold leaf. The next question was, would any similarly constituted organic compound do the same thing. Urea being an amide compound (carbamide), I thought at once of cyanamide. I thereupon added a solution of cyanamide (using the calcium cyanamide of commerce which is soluble to the extent of about 58 to 65% in water) to a cyanate solution, electrolized it, tested the solution as before with gold leaf, and dissolution of the gold took place in a few minutes. With a view to studying this peculiar reaction, I tried electrolysis on a solution of calcium cyanamide, without any admixture other than the addition of a little alkali to increase the conductivity. After electrolizing for ten minutes at a fairly high current density, the solution dissolved gold leaf in about fifteen minutes; this solution also gave a substantial titration with silver nitrate, showing probably that cyanide had formed. Again, treating the original solution with the addition of potassium thiosulphate and boiling, for the purpose of converting any cyanide present into sulphocyanide, on testing this solution with ferric chloride it gave the characteristic blood-red coloration of the iron sulphocyanide—surely ample verification. To make it more confirmatory, I added a solution of ferrous sulphate, to convert any cyanide in the solution into ferrocyanide. On addition of ferric chloride it gave, on boiling, the characteristic prussian blue. I was satisfied that some cyanide was formed by the electrolysis of calcium cyanamide, but as to the amount produced from a given quantity of cyanamide I was in the dark, owing to the peculiar behavior of the titrating solution in presence of organic compounds. It seemed from different experiments made, that the production of cyanide by electrolysis of cyanamide solution, was frequently below three to four-tenths of a pound KCN per ton of solution. During all these tests I used solutions analogous in strength to working solutions. On referring to Ward's 'Dictionary of Chemistry,' page 314, line 65, Vol. 2, I found that cyanamide combines with potassium cyanate to form mono-potassium amidodicyanate, whose formula is $(CN)_2NH_2OK_2$. Reflecting on this reaction, I thought it probable that, as the cyanide was formed by the electrolysis of the cyanamide, it was oxidized by the current to cyanate, the cyanate then acting upon the unaltered cyanamide to form potassium amidodicyanate. Potassium amidodicyanate when electrolized forms a powerful gold solvent, although it does not give any appreciable reaction on titration with silver nitrate. I have many notebooks filled with interesting data in regard to these reactions, and propose later to publish the results. I may state, however, that when a solution of calcium cyanamide is mixed with a solution of alkaline ferro-cyanide and allowed to stand for a few hours, and even after weeks' standing, it becomes an active solvent for gold without the aid of electrolysis, and when applied to the treatment of ores amenable to straight cyanidation, gives results, equivalent to the simple cyanide treatment, even in very dilute solutions. Further, this process can be used on ores which have already been treated by the cyanide process, that is to say, on residues. There exists in dumps a large proportion of prussian blue, which when treated with alkali becomes in substance, potassium ferro-cyanide and ferri-cyanide, or soluble prussiates.

This opens up a cheap means of treating ores amenable to the ordinary cyanide process as well as ores—residues—which have already been treated by the cyanide solution, that is to say, ores from which the precious metals have not been wholly extracted, and which would not pay for re-treatment by the ordinary cyanide process on account of the cost of cyanide. The following is an example of using this process upon ore amenable to cyanide treatment: Make a solution consisting of 2000 lb. of water containing one pound of calcium cyanamide, one pound of alkaline ferro-cyanide, one pound of lime. The ore is subjected to this solution in the ordinary way, in proportion of two parts of solution to one part of ore, for a period of say 8 to 10 hr., or until extraction is complete. The following is an example of using the process upon ore which has already been treated by the cyanide process and exposed to atmospheric oxygen which occasions the formation of prussian blue and other ferro-cyanogen compounds. The ore when treated with a solution containing one pound of cyanamide, one to five pounds of lime (the amount of lime of course depending upon the acidity of the ore), in 2000 lb. of water, gave results equivalent to the use of straight cyanide solution when used in the proportion of two or three parts of solution to one part of ore. Again, if the above mixture be electrolized the solution of the gold is extremely rapid. Calcium cyanamide mixed with alkaline sulpho-cyanide, electrolized, immediately becomes cyanide and dissolves gold rapidly. Another amide compound, guanidine carbonate, mixed with potassium cyanate, in conjunction with electrolysis of the solution, dissolves gold leaf in less than ten minutes. I might cite a long list of amidogen compounds in conjunction with cyanate solution if space would permit.

In the midst of this work on cyanogen-bearing materials the thought occurred to me to try the combination of calcium cyanamide and iodine. I forthwith made a solution of calcium cyanamide, adding a solution of iodine, to see if this combination would dissolve tellurium, and was rewarded by finding it to be an excellent solvent. I next tried gold leaf

*Abstract of a paper presented before the American Electrochemical Society, December 16, 1910.

with the same combination and had the satisfaction of seeing the gold undergo dissolution in a short time, a scum of calcium carbonate which formed on the surface preventing more rapid dissolution. From this I deduced that the addition of some free cyanogen gas to the cyanamide solution would increase the rapidity of dissolution of the gold. I was unable to find any reference to this compound in chemical literature which I have read, and I therefore, upon the basis of analogy, fix the above name and formula as the correct one. I next treated the action of cyanogen on the spot a solution of sodium cyanide made, knowing that if cyanogen iodide was present it would be destroyed by an excess of caustic and interpolating that this combination would dissolve telluride of gold. Upon applying the solution to tellurium and telluride of gold these substances at once dissolved, showing that the dissolution was probably due to cyanamidogen iodide, and I again presume the reaction to be in accordance with the formula

$$2ICN + CaCN_2 = CaCN_2I_2 + I_2CN_2$$

I will now describe the general method of using the Clancy process on the working scale. The ore is crushed by stamps, rolls, ball-mills, or any other efficient form of preliminary grinding mill. The degree of fineness necessary for the process being about 100 mesh, this is probably most economically accomplished by the use of tube-mills. The ore is crushed in a cyanide solution containing calcium cyanamide, sulphocyanide, and the halogen salts. It is, therefore, under the influence of straight cyanide treatment practically after leaving the rock-breakers and until it reaches the agitation tank, where it meets with electrolysis, which acts upon the cyanide solution containing the additional chemicals, and these, under the action of electrolysis, forms powerful solvents for the precious metals, as already explained. Before describing the treatment solution, the manner of dissolving the cyanamide should be known. Calcium cyanamide of commerce comes as a black powder and is about from 58 to 65% soluble in water. It is necessary, therefore, to dissolve the cyanamide in a separate tank and filter it from its insoluble residue. A small air-agitating tank is admirably suited to this purpose, and at the same time it will act as a cyanamide storage tank. The cyanamide solution may be made as highly saturated as desired, and the calculated quantity drawn off when required, and added to the cyanogen-bearing solution. The treatment solution is made up to 2000 lb. water, containing 1 lb. of cyanide, 2 lb. of alkaline sulphocyanide, 2 lb. of calcium cyanamide, and $\frac{1}{2}$ lb. alkaline iodine. If using crushing rolls after the rock-breakers, the product leaving the rolls at about 12 mesh is fed into the tube-mill and converted into pulp, by feeding the mill with the treatment solution and ore, in the proportion of one part of ore to one part of solution. The discharged pulp, after separation of the oversize, is transferred to the agitation tank to undergo electrical treatment. If it is thought necessary to remove the sulphides before, after, or during the treatment, the following method presents an ideal scheme. When solution with finely divided ore in suspension contained in the well-known cone-shaped tank in the proportion of 2 of solution to 1 of ore is [illegible] of solution to 1 of ore as above, [illegible] stopped for a few seconds, the finer [illegible] pulp [illegible] the [illegible] and by slowly opening the discharge valve at the base apex, the coarse ore [illegible] [illegible] with a small proportion of [illegible] [illegible] This [illegible] product may be [illegible] of some special [illegible] and the finely divided concentrate collected. The excess of pulp solution being returned to the agitation tank for treatment. Here is a means of eliminating the use of concentrating tables and obtaining a product of high value in small bulk. Again, the pulp being in a finely divided state, the pyrite or sulphide portion is not accompanied with quartz or gangue; therefore, a clean high grade concentrate is obtained, a result that can not be accomplished by the use of concentrating tables, without the employment of a large quantity of solution with attendant expenses. The pulp now in the agitating tank is of the correct alkalinity, this being previously established in the tube-mill by adding lime so as to contain from $\frac{1}{10}$ to $\frac{2}{10}$ of a pound 'protective' alkalinity per ton of solution.

The conductivity of the pulp is adjusted by adding common salt until the required voltage is obtained; 20 lb. of salt per ton of solution will invariably decrease the resistance of the pulp so that the volt motor will register about from 5 to 6 volts. In the majority of cases a current of about 50 amperes per ton of ore is adequate. It will be easily seen that the cost for electrical energy is not by any means prohibitive. With iron-oxide electrodes it is possible to obtain a current density considerably over 50 amperes per square foot of anode surface, so that one electrode 3 ft. long by 3 in. diam. will be sufficient for the treatment of from 3 to 4 tons of ore; in other words, approximately 30 of these iron-oxide electrodes would be required for the treatment of 100 tons of ore per day. If the treatment tank be constructed of iron the tank itself may be used as the cathode. This arrangement would, of course, decrease considerably the cost of installation. The electric generator is the chief item of cost. A low voltage generator, such as a 10-volt machine capable of giving the necessary amperage, can be obtained at any of the electrical warehouses. It is obvious, therefore, that the process may be applied to any existing fine-grinding plant provided with agitating tanks. All that is necessary, is simply to introduce the electrodes into the circulating ore pulp containing the necessary chemicals and switch on the current. It is essential in every case to maintain the protective alkalinity at about $\frac{1}{10}$ of a pound alkali per ton of solution so as to allow of the formation of cyanogen iodide and cyanamidogen iodide. About eight hours' treatment under electrolysis usually is sufficient to obtain the necessary extraction.

After the eight hours' treatment with the current, the pulp solution is brought up to about one pound per ton of protective alkalinity by adding caustic soda, and the cyanide contents regenerated up to about $\frac{3}{10}$ to $\frac{5}{10}$ of a pound cyanide per ton of solution. The regeneration of the cyanide is then ac-

complished simply by giving the pulp about two hours more current. It will be understood that the reason for adding the extra alkali is, that cyanide regeneration cannot take place in the presence of a halogen compound unless the solution containing sulphocyanides and cyanamide is made alkaline. It will be seen that the whole value of the process depends upon the recovery of the halogen compound. While I have described in the examples a proportion of two parts of solution to one part of ore, a proportion of three parts of solution to one part of ore may be used with advantage, that is to say, by using three parts of solution to one part of ore, a much smaller amount of alkaline haloid may be used per ton of solution; thus giving the same ratio of haloid salt per ton of ore as in the two of solution to one of ore pulp, and consequently a less proportion of soluble haloid to be displaced by the water wash in the final slime cake.

In this necessarily comparatively brief and incomplete description of the process, the use of chemicals and current have been described, but no mention of costs has been made. I will, therefore, take the following example to represent the typical working solution: 2000 lb. of water containing 1 lb. of cyanide, 2 lb. of sulphocyanide, 2 lb. of calcium cyanamide, and $\frac{1}{4}$ lb. alkaline iodide. This appears a formidable mixture when looked at cursorily, but on analysis it does not work out beyond the limits of economic treatment. For example:

Lb.	Substance.	Cents.
1	cyanide	18
2	cyanamide	6
2	alkaline sulphocyanide	12
$\frac{1}{4}$	alkaline iodide	35
	Total	71

This would not represent the total cost of one ton of solution, for, notwithstanding the effect of electrolysis, practically all the haloid salt, or salts, previously added, together with the sulphocyanide will be found unimpaired at the end of the operation, the cyanide and cyanamide alone suffering the necessary decomposition. It is clear, therefore, that no matter what the proportion of solution to ore, only the consumption of cyanide and cyanamide per ton of ore is to be taken into account. The amount of cyanide consumption on the ore, in presence of cyanamide, works out at about 1 lb. of cyanide per ton of ore treated. This consumption of cyanide is regenerated at the expense of 3c. for cyanamide, and at the outside 3c. for current (figuring current at 1c. per kilowatt hour), making a total cost of 6c. per ton of ore. Added to the above cost is the cost of the electrical energy necessary for the electrolysis of the ore pulp. The cost of electrical energy for this purpose works out at about 10c. per ton of ore treated, this added to the cost for cyanogen-bearing material and regeneration, would make a total of 16c. per ton of ore. These figures would represent the total cost, provided that all the solutions were recovered without mechanical loss. From this it is evident that the recovery of the solutions for re-use is a matter of vital importance to this process. The mechanical recovery of the solutions is, therefore, entirely dependent upon the efficiency of the filter employed. The Moore filter eminently fulfils the requirements for the recovery of the solution, inasmuch as it gives perfect uniformity of cake, both in thickness and porosity, which means perfect resistance, and perfect resistance guarantees perfect displacement. In fact, the business combination of the Moore filter with the Clancy process was originally brought about, not from any arbitrary or usual business considerations, but because, after the most rigid examination of all existing filter processes, I learned in my demonstrations that this type of filter was the only one that could be depended on to recover practically all of the solutions. This filter process is too well known to describe minutely. Suffice it to say, when the final step in the cycle of treatment is reached, that is, when the cake has been washed with barren solution, the soluble salts contained in the moisture saturating the cake at this juncture, may be completely recovered by giving the cake the requisite amount of water for displacement. The necessary amount of water for displacement is readily seen without calculation by the diminution of the water level in the wash tank. It has been necessary to mention the unique points of this filter so as to show how the solutions can be recovered with a minimum of mechanical loss and with a minimum of water wash. In a properly constructed Moore filter (type A), the loss of solution under proper manipulation should not exceed 10% of the total solution. It should be understood that the above costs are based on the treatment of rebellious or refractory ores and that they would in all probability be much reduced when dealing with non-rebellious ores.

WATER POWERS

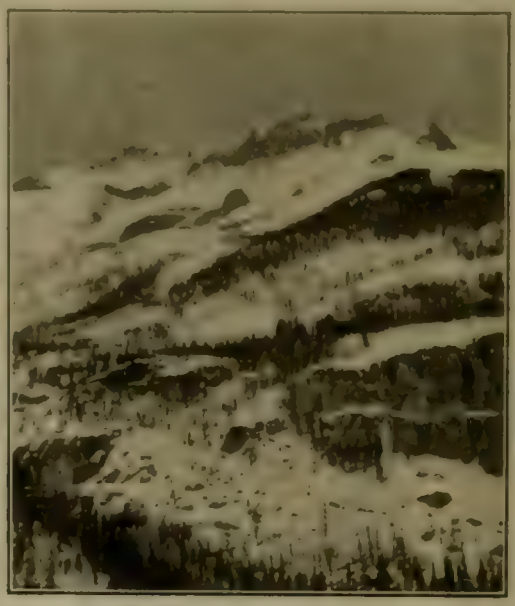
There is now withdrawn from disposition, pending legislation concerning water-power sites, approximately 1,450,000 acres of the public domain. In regard to them the Secretary of the Interior in his recent report says: "In the various public-land States and Territories containing water-power resources, in so far as there is present market for those powers, the title to areas greater in extent than that remaining in the Government has long since passed into private ownership, and it must be realized that any radical or burdensome restriction imposed by the Federal Government upon this resource will operate as a servitude on the public lands and discourage their development and use. Taking into consideration the facts that the States own the waters in the streams and have police power to supervise and control public utilities, it would seem a direct and effective method of control would be to trustee the power sites to the States in some such manner as proposed by a bill now pending in Congress. I earnestly advise the adoption of some legislation which will in any event retain the fee title to the lands in the people and effectually vest the power of regulation and control in the State or in the Federal Government, and which will not result in limiting prompt and economical development or permit monopolization or extortion."

Mining in the San Juan—III

By William B. Stoddard

Six miles above Ouray the new Camp Bird mill is situated, near the bottom of the east fork of Canyon creek, a hundred yards or more from a precipitous bluff over which the creek falls in a series of cascades. The mill which formerly stood on this site was destroyed by a snowslide in the spring of 1906, when two slides, one from each side of the canyon, rushed down the mountain-sides back of the mill, and uniting in one huge pile of ice and snow, rolled over the cliff and swept away the greater part of the mill structure. A day or two later, from some unknown cause, the débris caught fire and burned, adding to the scene of devastation, but aiding somewhat in clearing away the wreck previously wrought by the snowslide. The site of the Camp Bird mill is at about 9100 ft. above sea-level. Since the snowslide, precautionary measures have been taken to prevent as far as possible a repetition of the disaster of 1906 by the construction of rock walls and other structures in the usual path of the snowslides. These have been found to be of much benefit, as they appear to have the effect of preventing the slides from starting or at any rate in keeping the accumulated snow from coming down all in a single slide. Under all ordinary conditions the Camp Bird mill seems to be in no danger from snowslides at any time, but the experience of the past has taught the dwellers of the San Juan to distrust appearances, at least as far as snowslides are concerned.

The Original Camp Bird (United States) Mill.



Canyon of Sneffles Creek, Near Revenue Tunnel.

Camp Bird Mill, Looking Toward Ouray.

Camp Bird Mill in Winter.

The new Camp Bird mill was erected on the site of the one destroyed by the snowslide of 1906. It is connected with the Camp Bird mine by a Bleichert tramway two miles in length. The ore is delivered at the top of the mill, where the buckets are detached from the cable and pushed by hand along a horizontal track suspended over the grizzlies. A short section of this horizontal track is con-

...tested by a system of weirs with a screen and box...
...cross section of ore is stopped and weighed as it...
...passing by the instrument and the weight registered...
...so much or so gross work about the condition of...
...ore going to the stamps daily. This is my opinion...
...as a farmer which makes about eight and one-half...
...the net daily ore expenditure of the company is...
...advantage. From my observation of the flotation...
...could be set up a size smaller for the purpose. The...
...crushing the pyrrhotite and limestone have a ten...
...power of about forty tons. They have been built...
...with stepped bottoms and are of substantial con...
...struction. From the first bin the ore passes to the sec...
...ond crushing machines, known as Symons disc crush...
...ers, a number each weighing about twenty-eight tons...
...They crush 7 tons per hour each. The...
...screens used are the Hummer screen, 20 mesh, 20 sets...
...of the Lighthouse Screen Company. These have...
...been in use about six months and seem to be...
...serviceable machines. The screens are placed in the...
...mezzanine floor and overhead at the top is the...
...main ore bunker.

There are a number of things in the Camp Bird mill...
...that are to the average operator unusual and are...
...worthy of description. Nothing of either the...
...crushing or flotation appeared to be perfect...
...in the best sense of the word. The crushing...
...plant of the mill as it stands at the present time...
...was the last thing put in the mill, as it was not...
...in use. The primary crushing of the ore is done...
...in the mine. The ore from the various levels is...
...dumped into a bin which I found to be directly in front of...
...the main shaft and between the amalgamating...
...floor. This bin itself has been made of steel rails...
...to consist of large vertical bars from the...
...original mill and which have been found to answer...
...the best purpose to which they have been put since...
...their arrival. The mortars each weigh 2000 lb. and...
...rest on a iron and I angles which are solidly bolted...
...to heavy concrete foundations. The battery posts...
...stand on streak sills that are bedded on the con...
...crete of the foundations.

From the mortars the pulp passes to a 24 ft. run...
...of silvered copper amalgamating plates 4 ft. wide...
...From these plates the pulp goes by short launder...
...to revolving mercury traps one to each five stamps...
...In these traps is recovered a large amount of quick...
...silver and amalgam. I had heard that at the Camp...
...Bird mill the sand went to belt machines and the...
...slime to Wilfley's. This I knew to be contrary to...
...common practice to say the least but current re...
...port was as usual, inexact. However I did find...
...another innovation. From the mercury traps the...
...pulp goes without classification to 6 ft. cones of...
...the Frue type. Two to each battery of 5 stamps...
...as the ore carries a variable though large percentage...
...of sulphides and water-jacketed, also other minerals...
...of high specific gravity. But which are of no com...
...mercial value. From the cones the tailing goes to...
...a large pot-bottom. The sand from which is sent...
...to Huntington mills to which it is ground and to 10...
...mesh with a minimum of slimes. The re-ground...
...material is again passed over amalgamating plates...
...and from these goes by launder to the cyanide plant.

The washing from the classifier goes to 11 Wilfley...
...tables and the overflow to the cyanide pond...
...proper. J. H. Woods the mill superintendent kept...
...from the machines sent to the Wilfley tables con...
...taining the greater part of the chalcocite mineral...
...present, which is more or less abundant in the...
...Camp Bird ores and that to this source he was able...
...to attribute a good part of it. He further stated...
...that he considered a classification in the cyanide...
...tubes. Some of the other mill superintendents to...
...the westward, and at Telluride seemed to have found...
...mechanical launder or classifier. However this...
...is not so strange when it is considered that the...
...metallurgical practice at the various mines of the...
...San Juan region is entirely dissimilar, no two mills...
...employing the same process even when situated side...
...by side as at Telluride. In fact the mill practice...
...in the several mills is as varied as though the mines...
...were a thousand miles apart.

The cyanide department of the Camp Bird is in...
...charge of A. C. Bassler. The mill is provided with...
...both water and electric power. The water is under...
...a head of 340 ft. but the available voltage is varia...
...ble. It is governed as far as possible electrically...
...through the generators. The mills are heated by steam...
...and the tubes are kept at about 65 degrees Fahrenheit...
...the year.

Low Mortars and High Heads

By M. P. Ross

The gravity stamp is a mechanism of simple con...
...struction and its wearing parts are easily renew...
...able. The repeated recurring drop of stamps in...
...action generates vibration of the foundation and...
...framework which is the one trying element of con...
...struction. An individual blow from a stamp creates...
...but small square inch pressure at the bottom of the...
...mortar, but the rhythmic recurrence of drops vi...
...brates even the earth upon which it stands, some...
...times noticeable hundreds of feet underground.
There are two sources from which this vibration is...
...generated, first from the camshaft in picking up...
...the stamps and second from the mortar that re...
...ceives the blows. Low and flat foundations are...
...better for minimizing vibration than high pedestals.

The vibration in the stem of the stamp is distinct...
...from and independent of the vibration in the foun...
...dations of the battery. The material upon which a...
...stamp falls is uneven in size and is not evenly dis...
...tributed over the die, so that the arrest of the blow...
...will usually be mostly away from the axial centre of...
...the stamp which will give a lateral strain or wrench...
...to the stem. The vibrating effect of this strain...
...upon the stem varies with the structural design...
...which centre of gravity of the stamp, the lower...
...guide high above the die and guides wide apart,...
...are factors conducive of vibration. The stems in...
...such a battery construction usually will begin to...
...break after having been about a year in operation.

By making the stamp-head long and the stem...
...of minor gravity so, thereby bringing the centre of...
...gravity low and by putting the lower guide as close

to the head as its movement at operation will admit, the vibration of the stem will be so controlled that breakage is practically eliminated from consideration.

When I took charge of the Bonanza [illegible] low mortar as compared with ordinary practice, to

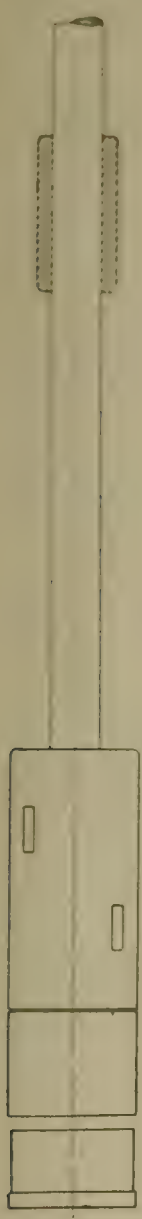


Fig. 1.

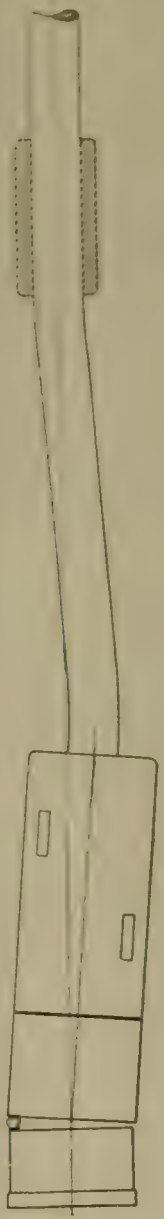


Fig. 2.

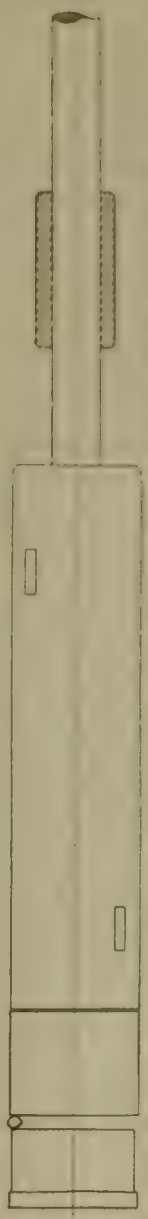


Fig. 3.

Fig. 1 shows a stamp of common design and proportions. Fig. 2 is the same stamp, showing (by exaggeration) how the stem is caused to spring. The spring is followed by vibration and continued vibrations cause stem breakages. Fig. 3 shows how stem vibration is so minimized that breakage of stems rarely occurs. A long stamp head, with the lower guide set low, permits but little spring.

with me an old idea. As far back as when the French company built the 60-stamp mill at Quartz mountain, in Madera county, California, about 1884, I put in low mortars with heads running close to lower guides to minimize stem breakage. The next low mortars I put [illegible] mill at Pioneer, Arizona, which started crushing March 1, 1887. This mill I also built, [illegible] Bonanza conditions and with improvements. The latter [illegible] the pulps accepted with a delay of [illegible] few years, but the low mortar has since become [illegible] the Bonanza stamps where I first successfully [illegible] I continuous [illegible] run of ten new 40-drop mill after I incorporated the Hendy Iron Works of San Francisco of Pioneer, of which I was [illegible] director and largest individual owner for more than seven years. There were only four stem breakages throughout the years following. I have not known or heard of a single stem breakage in all other mills in which I have placed low stamps with low mortars and long heads. During these many years I have heard no tangible objections or argument against low mortars and long stamp heads, but the mining public has continued indifferent. This standard mortar, the plans of which I sent to Africa through Fraser & Chalmers of London, was novel in the peculiar construction of its housing around the stamp head and in the liners. **The front liner is extended upward with** an open panel to hold the screen and is held in place by being slid down in a channel and held by a cope casting. A number of these liners of different heights or modifications may accompany each mortar. The screen is let into the liner panel to present an approximately flat front to the splash. This front liner also has upon its inner surface inflecting lugs to augment the splashes over the screen. The back liner is shaped to somewhat encompass the dies sufficiently close to facilitate the suction action of the rising stamp. Effective suction of the rising stamp is an important factor in crushing by stamps. **The bottom liner has pockets to receive the neck** of the dies, such as are shown in Fig. 4.

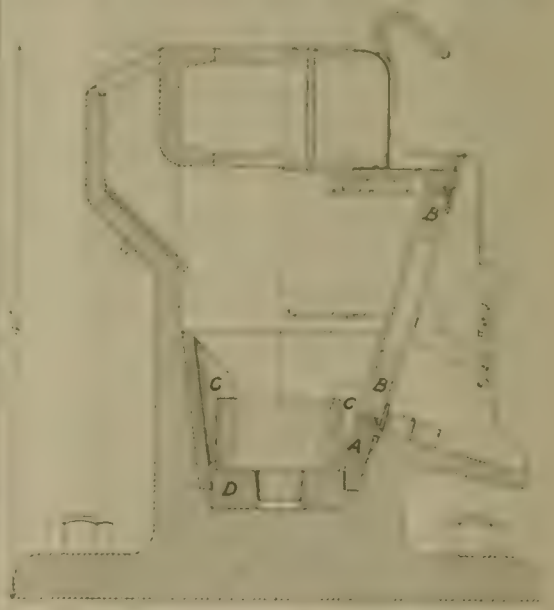


Fig. 4. Low Mortar. A, Front Liner. B, Screen Frame. C, Back and Front Liners Shaped About Die. D, Bottom Liner.

Future of Dredging

By Charles Janin

The future for gold dredging is a matter of growing interest in California and elsewhere. It is the contention of most engineers and operators familiar with the conditions, and is undoubtedly true to a great extent, that the limits of dredging areas in California have already been fairly well defined, and that the greater portion of the field is controlled by the large interests. Other engineers are more optimistic and believe that tracts which have previously been passed over, or reported on unfavorably, when prospected some years ago, still hold possibilities for the future. With the great advance made in the industry and the development of the modern dredge, from the earlier successful boats with their 600 cu. yd. per day capacity, to the boats with 16-ft. buckets and the estimated capacity of 300,000 cu. yd. per month, and the reduction of working costs, under favorable conditions, to less than 3c. per cu. yd., it is obvious that areas which a few years ago were considered too low grade to equip with a dredge will, under present conditions, again attract the attention of those interested in the dredging industry. Another fact that is drawing attention to these areas, first considered unprofitable, is that the life of some of the successful dredging companies is drawing to a close; that is, the land for the working of which the company was originally formed is being rapidly worked out. Several of these companies are realizing that their ground is nearly exhausted, and that the company has one or more dredges in good condition, fit for some years of working life, so far as the machinery is concerned, and, what is probably more important, a well organized working force, valuable experience in dredging matters, money in the treasury, and the confidence of shareholders. The machinery from dredges that have worked the areas for which they were built, or that have been dismantled and replaced by larger boats, has been overhauled and refitted on new hulls in different fields. Dredges that were at first installed on ground in Colorado which proved unprofitable, were dismantled and the machinery is being used on hulls in California. The machinery from several California dredges has been moved to other fields in California, and in some cases to Alaska. The machinery of a good dredge can be refitted on a new hull and installed on a nearby property, in some cases, at less than 50% of the cost of a new boat, though it must be recognized that these boats may not always be best suited for the most economic handling of low-grade gravel. The salvage in these disused boats, and exigencies of stock manipulation, will without doubt have considerable influence in deciding the management to favor the working of new areas. Aside from such influences, there is no question that under favorable conditions areas that were at first considered unsuitable for economic dredging can now, with improved methods, be profitably handled. The possibilities of reclamation of dredged land may prove a not unimportant item in estimating the profits to be won from dredging areas in California. The success attending the efforts of some operators in this direction has greatly broadened the expectations for the future of what was, until recently, considered worthless land. A more liberal attitude on the part of the agriculturists and arrangements permitting the modification of some of the rulings of the Débris Commission would open areas to the dredging industry that are at present closed. Altogether, it seems probable that there will be opportunities for profitable investment in California dredging for some years to come.

In Alaska there is a growing demand for dredges of the smaller class, having 2½ to 7 cu. ft. buckets, a number of which have been installed in the last year and several of which are planned for 1911. In addition to these smaller boats, the Far North can boast of one of the largest dredges yet constructed, a Marion 16-ft. bucket dredge installed on the Boyle concession in the season of 1910. This boat has a total weight of 900 tons and will dig approximately 10,000 cu. yd. per day. On this same property a Marion 7-ft. bucket boat has been successfully working since 1906 and is still in good condition; for the past season it is said to have averaged 3700 cu. yd. per day.

Besides the possibility for new dredging areas in California, and other Western States and in Alaska, the attention of dredge operators has been attracted to the many opportunities for the installation of dredges in foreign countries. Much interest has been manifested in Siberia of late, and a number of American engineers have been engaged during the past year in the examination of Siberian gravel properties. Most of these engineers went out for English companies which are, perhaps, better able than Americans to cope with some of the disadvantages of operating under Russian authority. For reasons obvious to those familiar with conditions, it will be found advisable in starting new enterprises in that country for Americans, or other foreigners, to have the assistance of, and be associated with, influential Russians. A number, if not all, of these recent examinations of Siberian gravels resulted unfavorably, some on account of the low grade of the gravel, others because of severe business conditions or exorbitant prices imposed by the owners. However, there is no question that, so far as operating conditions are concerned, there are areas of gravel in Siberia that can be profitably worked. A more liberal policy on the part of the owners of some of these tracts may result in dredges being erected in the near future. Recent reports from the dredges operating in Siberia show an increased working efficiency, both in the yardage handled and the percentage of gold recovered per dredge. This is undoubtedly due to better management, the employment of heavier and more modern dredges, and the practical experience gained from operation. Without doubt, the increased success of these boats will stimulate new promotions and will result in further investments being made.

Recent engagements of experienced engineers for

West Africa indicate that it is being more seriously considered as an attractive field for dredging investments. Some of the first dredges there as in other fields were failures but the employment of competent men is the first step toward obtaining reliable knowledge of existing economic conditions and securing the installation of suitable dredges when they are warranted. This practice if more often followed, would save investors much money and give a far better tone to the mining business in general.

It may be said that the majority of dredges placed in South America have been unprofitable. This has been due, in part, to a failure to recognize, or to properly appreciate, the difficulties of installing and operating a dredge under the conditions existing in South American countries, and in part to equipping a property with unsuitable dredges on ground, the value of which was optimistically guessed at rather than determined by careful sampling. In other words, the failures in South American fields, as elsewhere, may be attributed to investments being made without proper engineering advice. Notwithstanding the early failures and the consequent disrepute into which South America has fallen in this respect, dredging properties of merit, properly presented, will receive ready consideration from capitalists. Some California engineers have been recently engaged in examinations in Colombia, Brazil, and other South American countries, and several engineers of experience believe that there are excellent opportunities for profitable dredging in these countries. The most important dredging work in South America is that on the property controlled by the Oroville Dredging, Ltd., on the Nichi river, in Colombia. The area was carefully examined by capable engineers, and is probably the first South American property to be drilled and prospected in the systematic manner in which such work is done in California. Over 300 acres were proved to be profitable dredging ground. The company has a concession of 22,000 acres, the greater portion of which has not yet been prospected, and there seems little doubt that other parts of the concession will also be found to contain gravel of workable grade. A hydro-electric plant has been built and an 8½-cu. ft. bucket, California type, dredge, with steel hull, will be built. The success that will follow the efforts of the experienced management of this property will encourage the exploitation of other areas and undoubtedly prove an incentive to other dredge installations in South American fields.

In French Guiana, dredging has been tried so far on three rivers only: the Curcibo, the Sparwin, and the Lizard. Three new dredges are in course of construction in those places, an indication that the first results, either in dredging or in prospecting, have been encouraging. There are in French Guiana other rivers equally rich. According to the latest reports, a new dredge operating in Roche creek, carefully prospected in 1908, has given an output of 8 kg. in March and 10 kg. in April 1910 (1 kg. of this gold is worth about $500). Experiments extending over a period of 6 months were made with an English dredge of 1880 m. the cost of operation was a loss but which owing to difficulties of operation was unable to wash more than from 381 to 460 cu m in 24 hours. These experiments are said to have demonstrated that the cost of operation in handling this amount of gravel was from 36 to 42c per cu yd. Operating conditions are likely however to improve with further experience. In British Guiana, dredges are successfully operated where the gravel is much lower in gold content than that of French Guiana. It might be that better results could be obtained in French Guiana by employing convict labor, but thus far experiments in this direction have been far from encouraging; another attempt is to be made on a placer near S. Jean du Maroni, the outcome of which will be watched with interest. An entertaining account of the 'Goldfields of French Guiana' by Albert Bordeaux, from which the above paragraph was abstracted, appears in the Trans. Amer. Inst. Min. Eng. for November 1910. In Dutch Guiana, gold dredging has been carried on along the Saramacca and Marowijne rivers with small Holland-built dredges. It is said that some of these operations are successful and that other installations may soon be made.

In Mexico, several gravel areas have at times attracted attention. A dredge was installed at Suaqui Grande, Sonora, some years ago, but was not a success. Other places in Sonora along the Yaqui river, near Tonichi and San Antonio, were prospected with Keystone drills with indifferent results. A prospecting party is now drilling at the latter place, but reports from it are not encouraging. The dry placers of Altar have been brought into prominence recently by the success of the Quinner 'dry-washing' machine, and it is believed that these will prove of importance. In Sinaloa there are places where it is claimed that the ground could be profitably dredged. It was reported that a dredge was to be installed there some months ago, but nothing definite has since been heard regarding it. Although successful dredges may be installed in the future, the present outlook for gold dredging in Mexico is not brilliant.

Among other fields that may be mentioned as offering possibilities for gold dredging are Korea, China, and the Philippine Islands. In Korea tests have been made of gravel areas and it has recently been reported that a dredge is to be erected. In China there has been no dredging, but engineers consider that there are areas in the northeastern part which are worthy of investigation. The only successful dredging in the Philippine Islands has been carried on in the Paracale district, which is situated in the northern part of the province of Ambos Camarines on the eastern coast of the island of Luzon. It has been described in 'The Mineral Resources of the Philippine Islands', published by the Division of Mines of the Bureau of Science. The placer ground in the vicinity of Paracale generally consists of about four or five metres of barren clay mixed with organic matter overlying a varying amount of gray clay carrying small quantities of gold. Below this is an irregular layer of sand and

quartz pebbles, in places showing large amounts of free gold. Dredging operations have been carried on by the Paracale Gold Dredging Co., a New Zealand corporation; the Stanley-Paracale Co., whose dredge is at present shut down, and the Philippine Gold Dredging Co., which bought a dredge originally erected on the island of Masbate. This latter dredge was found unsuited to the ground on the Paracale river, and was again moved, this time to the Malaguit, where it is said to be successfully working. The Paracale river is really an arm of the sea, with a tide rise and fall of some 5 or 6 ft. The flat in which it runs is perhaps a mile wide near the mouth. It continues about the same width for a mile or more, and then spreads out into smaller flats with ranges of hills between. The total area available for dredging in this flat is estimated at 1300 acres. The average depth is 30 to 40 ft. on the lower river, but higher, where the Stanley dredge is working, the depth is considerably less. The Malaguit river, which flows into the Pacific not far from the Paracale, has been prospected with hand-drills. There is a much larger percentage of gravel and heavy material there than on the Paracale. Several other streams in the same district have been prospected to some extent, with results not altogether favorable, but on the Gumas it is reported that a Bucyrus dredge will be installed in 1911. Low hills and ridges divide the tidewater streams and, except where cleared by the natives for growing hemp, are covered with heavy timber and a dense undergrowth, so that prospecting is difficult. Some engineers familiar with the conditions there consider that there are good opportunities for gold dredging in the Philippines; others, of equal experience, are not so optimistic.

In Burma there are numerous gravel areas, some of which have been worked for generations by the Burmese, who employed a rude method of ground-sluicing. A number of these areas have been more or less thoroughly prospected, and several dredges have been built, a number of which were failures. According to J. Malcolm Maclaren, in 'Gold, Its Geological Occurrence and Geographical Distribution', "of all Burma's numerous auriferous alluvial deposits, none has been considered worthy of extended trial except those owned by the Burma Gold Dredging Co., above Myitkyina. There three dredges were at work in 1907 with results considered so satisfactory that a fourth dredge of greater capacity was being built." Figures for the past year are not at present obtainable, but according to an article in *The Mining Journal*, in November 1909, these three dredges worked 6 days a week for an average of 46 weeks and turned over a total of 1,918,200 cu. yd. for the year, with a total recovery of £32,000, or 8c. per cu. yd. The operating cost, including management, is given as 3½c. per cu. yd. It is possible that dredges will be placed on other properties; a California type, Bucyrus, boat, has in fact been ordered by the Mewaing Gold Co., Ltd. As the success of the Burma Gold Dredging Co. encourages further investigations, doubtless other areas will be found that will prove profitable dredging ground. The Wa country is held to be particularly attractive by some, perhaps on account of being inaccessible to the ordinary prospector. The Was, that is, some of them, are inveterate head-hunters, and while the prospector often figuratively loses his head over a mining proposition, he is not inclined to take too great a chance of doing so literally.

In Japan, according to a report recently issued by the Bureau of Mines,* "from early times many placer workings have been carried on in the river beds or terraces along the river-sides in the districts of Kesen, Wakuya, Hayakawa, Abekawa, Yoshinogawa, etc. Recently they have begun to be worked in many localities in the Hokkaido, and the river Kilung in Formosa. Up to the present time, only the surface placers have received attention, for which reason no gold dredging or underground working has been attempted. The largest nugget ever found in Japan weighed only 27.1 oz. and was found in the gold-bearing gravel at Yesashi. The greater part of these deposits are in the Alluvium, while a few of them are discovered in the Diluvium, yet we never find any Tertiary placers."

Unhealthy climate and difficulties of transportation must be taken into account in many places, and have prevented the exploration of the gravels of certain Colombian fields by modern methods. None the less, several dredges have been installed in different parts of Colombia with varying success. In tropical countries there are many drawbacks that should be thoroughly understood by anyone purposing to invest in mining properties. Often rough mule-trails are the only means of entering a district and the transportation of heavy machinery would be impossible until some kind of a road was built. Attempts to sectionalize dredges have not been as successful as with other classes of mining machinery. In Guiana the only means for transportation of machinery along the rivers is by canoe. One dredge failed to reach its destination because the hull pieces were too large to be taken over the first rapids. They are still to be seen along the trail. The attempt was made to remedy this loss by building a wooden hull on the ground, but in that climate insects and worms destroy wood in a short time. To overcome this trouble, the next hull ordered was made in smaller pieces. Climatic conditions in the tropics are generally trying; the heavy rainstorms during the long wet seasons, and malaria and beri-beri are to contend with. The inefficiency of native labor is also a serious matter, though in some cases it has been possible to instruct natives to operate a dredge, with a white overseer in control. There is always difficulty in securing and maintaining an efficient and honest staff of white labor so far from home, and it is generally found necessary to have a reserve corps to fall back on when occasion requires. All these are things that must be taken into consideration in judging the economic conditions and feasibility of operating in tropical countries. The loss of time from sickness alone is

*'Mining in Japan, Past and Present,' pp. 65. Bureau of Mines, Department of Agriculture and Commerce of Japan, 1909.

not an unmitigated loss to any person, nor to any engineer who has acted in a strictly honest manner, and exercised reasonable care. Cases are known where engineers have been stricken with illness that has made assistants more or less incapacitated because of the time from sickness. On another trip the same engineer in charge contracted a fever which proved fatal. In fact, go anywhere as elsewhere in making investments in dredging, much money may be saved and disappointment avoided if prospective investors will insist upon having reports by experienced engineers rather than listening to the advice of optimistic incompetents and going blindly into enterprises that, to be an economic success, require experience and good management in every phase of the work. With the drawbacks of operating in foreign countries, together with unfamiliar government regulations, and other disadvantages incident to operating so far from home, there is little doubt that possible dredging areas in California and other States, though of lower grade than some that are being at present worked, and of much lower tenor than necessary for profitable operation in foreign countries, will nevertheless be more attractive to conservative investors than the foreign fields. Many investors, however, will be attracted by the higher value of the gravels claimed for these latter places, and some operators, being daring, and far-sighted enough to investigate first and undertake later, if their engineer reports favorably, the risk of new enterprises in a foreign country, will, profiting by their knowledge of the industry, build suitable dredges and make a success of the venture. Investors with little or no experience will, as heretofore, rush in with an insufficient knowledge of conditions and, generally, as might be expected, lose their money. There is no form of mining from which the profits can be more closely estimated at the start than gold dredging, provided experienced judgment has been used in the details of examination and prospecting. Under these conditions and with proper management, it becomes a safe and profitable investment. Gold dredging, or any branch of the mining industry, without honest and efficient management and competent engineering advice, becomes, instead of a profitable investment or a sane speculation, nothing more or less than a wild gamble.

ILLINOIS PETROLEUM PRODUCTION

Figures showing in detail the production in barrels, of petroleum in Illinois in 1909 are given below. They were collected by the U. S. Geological Survey in connection with the Census Bureau.

January	2,668,607
February	2,510,548
March	2,757,794
April	2,562,215
May	2,829,277
June	2,670,549
July	2,728,857
August	2,719,958
September	1,902,197
October	2,560,072
November	2,497,847
December	2,490,418
Total	30,898,339

Geology of the Jarbidge Mining District

By Steele W. Sanford

Much has been written during the past year in regard to the wealth stored in the hills of the Jarbidge mining district in Elko county, Nevada, but very little has been told of the beds themselves. The name Jarbidge, called by the Indians Ja Ha Bich, is given to the high peaks of the range, and means "The Devil." The Jarbidge district is situated between the west and the east forks of the Bruneau river, excluding the middle fork, or Jarbidge river, a district of about 18 miles in width, and from the Idaho line, which bounds it on the north, southerly for 25 miles, including the head waters of the Marys river. The highest and most prominent range of hills occurs between the Jarbidge river and East Fork, and runs north and south, reaching an altitude of 11,000 ft., yet this range does not determine the drainage of the district, which is generally nearly

north-south, from a high divide running east-west.

Geology.—The district exposes several geological formations, the oldest being the sedimentaries exposed on its western part. These for the most part strike east-west, and dip north at an angle of 60°. They consist of quartzite, limestone, and shales, named in the order of deposition. The beds show a thickness of several thousand feet. No fossils have thus far been found in them.

Granite.—An intrusion of coarsely crystalline gray hornblende granite has faulted and tilted the sedimentaries, and concurrent with or immediately following, the intrusion of the granite dikes of granodiorite have cut the limestones, further faulting them. This disturbed area then underwent extensive mineralization. A long period of erosion followed, which wore down the overlying strata and exposed the granite.

Rhyolite.—Resting unconformably upon this basement complex is a series of Tertiary eruptives, consisting almost entirely of rhyolitic flows. These at

one time covered the larger part, if not all of the district. Erosion has removed them in the western part, except a few remnants upon some of the higher peaks. The greatest thickness exposed in these Tertiary beds is in the Jarbidge peaks, where from the level of the river to the summit of the peaks it presents a thickness of 4700 ft. But even here, 1000 ft. above the river, amid the rhyolites is a ridge of the old basal plane, a stratum of micaceous and graphitic quartzite, striking N.W.-S.E., and exposed for a distance of two miles, being 200 to 400 ft. in width. The rhyolite flows vary in thickness from 50 to 500 ft., and upon the east fork of the Bruneau 12 successive flows can be distinguished where cut through by the river. Their texture grades from the true rhyolites, to the quartz and granite-porphyries, pale green in color. They contain considerable magnetite, which in weathering tints the cliffs with beautiful coloring. The beds rest conformably upon one another in level lines. Between several of them, beds of shale occur which are only a few feet in thickness. Whether or not these are fine-grained eruptives, or of sedimentary origin, could not be determined without petrographic study, but I judge them to be sediments. The rhyolites lie horizontally, showing neither faulting nor folding. The latest eruptives in the district are the basalt flows, which are the lower end of the vast area of the Snake river lava flows. They are crystalline, showing phenocrysts of feldspar. These rest unconformably upon the rhyolite and form a plain, which surrounds the rhyolite upon the north and east sides, rising to a height, near the east fork, of 10,000 ft., and showing several separate flows which are homogeneous.

Erosion.—Across this plain the streams have cut deep canyons, often with vertical walls. As the sources of the streams are approached, which are in the rhyolite area, the canyons widen out, and the sides form steep, grass-covered hills, with even contour, except where sharp needles and cliffs, due to the varying resistance to erosion, stand in bold contrast to the smooth surface. Along the contact between the rhyolite and basalt erosion has been an important factor in the present relief of the district.

Mineralization.—There were two periods of mineralization in the district. The first probably concurrent with, or immediately following the granite intrusion in the western part of the district, where a series of fissures, running N.E.-S.W., cut the limestones and grano-diorites, and a large number of small quartz veins have formed. These veins carry gold and silver, the gold often free at the surface, and some placer has resulted from their erosion. The ores are base, however, at shallow depth, and this fact, coupled with lack of transportation, has retarded the development of the district. The veins in Jarbidge camp occur entirely in the rhyolite. The mineralized district seems to be about three miles long and three miles wide. In the centre of the district are the quartzite strata previously mentioned. Veins occur on each side of its strike, and have several distinctive features. Those on the west, at present the most promising, have the form of a network of veins, whose general strike is N.20°W., with a dip of 80° to the east. These appear to be more of a brecciation of the rhyolite than of clean open fissuring. Evidence is lacking at this time of any movement of the vein-walls, either during the deposition of the mineral or subsequent to it, with the exception of the large Buster vein, which shows slight slickensides upon its walls. There has been no important faulting in the district since the vein formation. The rhyolite forming the wall-rock of the veins is unaltered, and remarkably fresh, only a few inches from the vein matter. The gold does not penetrate the walls of the fissure. The rhyolitic breccia is silicified and distinct walls are often lacking. One would judge the solutions to have been neither very hot nor concentrated, and their chemical activity very slight. The veins upon the east side of the quartzite strike nearly north-south, and dip west at 70°. They are beautifully banded, the bands often being separated with small seams of gouge. The walls are clear and distinct and accompanied by several inches of gouge. The formation of these fissures was accompanied by normal faulting. The veins of the camp vary in width from 6 in. to 12 ft. The values are irregular, and sufficient work has not been done to prove the average value of the ore. The silver occurs both as an alloy with the gold, and probably, as argentite.

Amalgamation Following Fine Grinding

By C. F. Spaulding

Modern metallurgical practice is working more and more toward fine grinding. There is no question but that the finer an ore is ground, up to the point where all the metal becomes free, the better the extraction will be. This is especially true in cyanidation, and the same thing should apply to amalgamation. In my experience of the last few years I have found that the finer the ore is ground the better the extraction. The trouble in fine crushing in stamp-mills is the small capacity per stamp. The high cost in crushing fine is due to this small duty, the labor and power being a constant factor whether two and one-half or five tons be the stamp capacity. The wear and tear on screens, shoes, and dies is higher per ton with finer crushing. Another point in fine crushing in stamp-mills, to 40 mesh or finer, that I have noticed but never seen discussed in print, is the fact that the apdon plates are apt to become covered with a velvety coating of slime, which is about as hard to handle and keep off the plates as the copper salts that bother so many mill-men. If the pitch of the plates be steepened so that this coating does not form, everything goes over them with a rush, the percentage saved by amalgamation dropping sharply. I have evolved the following scheme to get around this. It is open to discussion and the free use of the mill-men.

In this scheme there is to be used no special machinery. Everything is standard machinery, rolls, crushers, tube-mills, which any machinery company can furnish, with the exception of the special amalgamating device, which in case the mill is new can

be kept by any machine-shop. A 30-ton plant of a mill already built can be made by any good millwright and installed. Fig. 1 shows a flow-sheet for a 100 to 125-ton mill. Other size mills can be handled up by using one or more units or by increasing or decreasing the sizes of the crushing plant and the tube-mill plant. The flow-sheet is self explanatory.

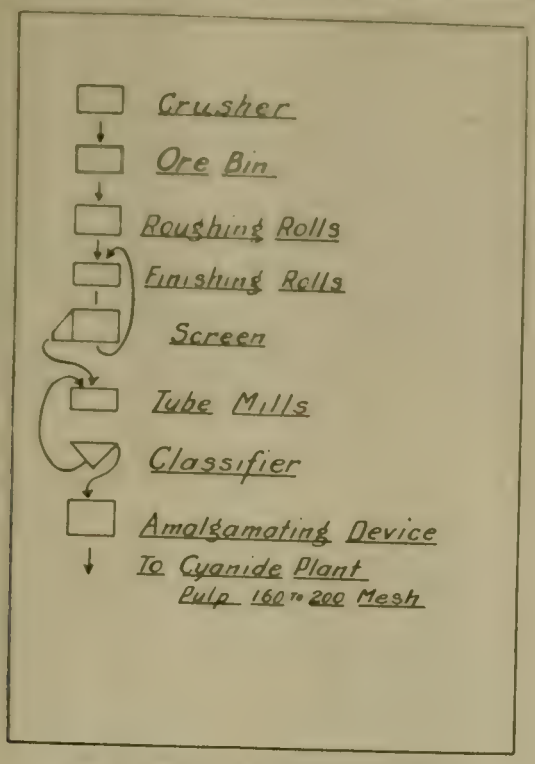


Fig. 1. Flow-Sheet for 100 to 125-Ton Mill.

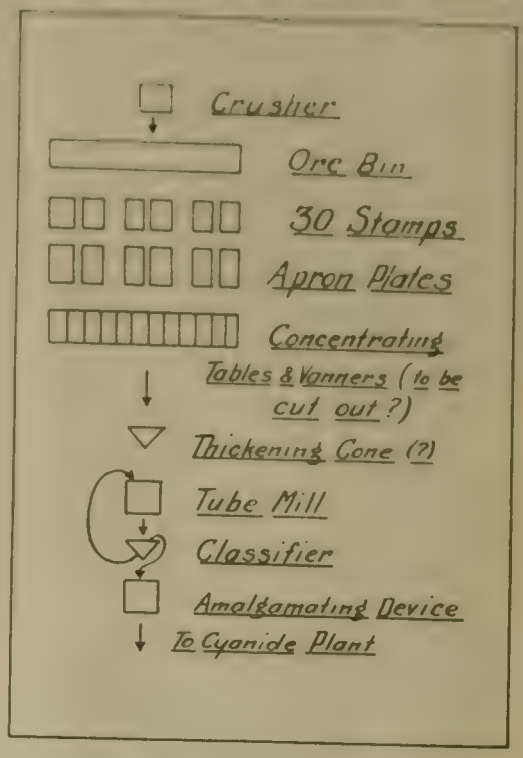


Fig. 3. Flow-Sheet for 30-Ton Mill.

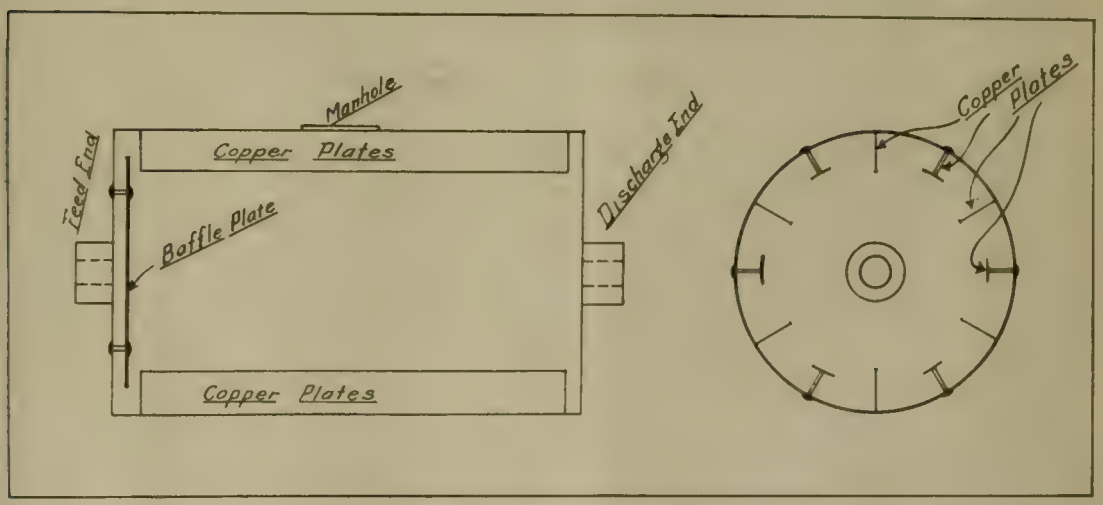


Fig. 2. Amalgamating Device.

Fig. 2 is a rough working sketch of the amalgamating device, to be used in new plants or to be put in an existing mill following the tube-mills, as shown in Fig. 3, which is a flow-sheet for an ordinary 30-stamp mill.

The amalgamating device is simply a revolving tube or barrel made out of wood or iron, revolving on tires or trunnions. Any old cylinder that can be as could readily be passed in and out through the manhole, which should be either on one end or the side. The arrangement of the copper plates, the size, and whether it is desirable to line the amalgamating device with a copper plate, cast iron, or leave it bare, is left to the judgment of the designer of each mill. Fig. 2 is merely suggestive. The sketches showing the amalgamating device and flow-

sheets are general in their character and are only intended to give broad plans on which to work. The design of any mill would have to be worked up to conform to existing conditions.

I have had a couple of mills situated so far away from the railroad that it hardly paid to ship the concentrate. Freight charges on the railroad and wagon freight ate up all the profits. At these I built an arrangement on the lines of an arrastre, connected it to the mill shafting, and ground each shift's output of concentrate very fine in cyanide solution. By sliming the concentrate and thoroughly washing it the extraction was brought up to 87 to 93%. Practically the only cost was the consumption of cyanide, as the power used was not great and the mill-men attended to cyaniding the concentrate along with their regular work. The net returns were far ahead of shipping to the smelter, paying freight charges, and smelter charges, and only getting $19 per ounce of gold.

Returning to Fig. 3, by cutting out the apron plates, with the necessary cost of dressing and lost time in hanging up to dress the plates, the concentrating tables and vanners, with the usual cost of attendance and power, and turning the pulp direct from the batteries to the tube-mill, or maybe putting a thickening cone in between the two, would evidently result in great saving in labor, power, and repairs. I believe that in the majority of cases the concentrating table can be cut out. There will be some cases where it may be advisable to retain them. By following the tube-mill with a classifier and returning the spigot product to the tube-mill, the heavier concentrate, which will naturally go to the spigot product, will be re-ground several times and will be much finer than the gangue material. Knowing this and the results obtained in cyaniding concentrates, there is no doubt that in the majority of cases the concentrating part of the mill can be dispensed with.

An ordinary 30-stamp mill with a capacity of 100 to 125 tons per day, costs to erect from $25,000 to $40,000. To re-grind the tailing in tube-mills will call for additional machinery costing close to $5000 erected. A mill on the lines shown in Fig. 1 can easily be erected for $15,000. The building is much smaller and the cost of machinery, freight, and labor to install, is also much less than for a 30-stamp mill. The operating cost, labor, repairs, lost time, heating, etc., will be much less than in the average 30-stamp mill. One man on a shift, outside of the crusher and power men, who will be the same in both cases, will handle this mill, as against two or three men on a shift in the stamp-mill.

By grinding in cyanide solution in the tube-mill, the cyanide plant can be simplified somewhat. In ordinary stamp-mill practice the pulp is in contact with the copper plates 12 to 15 seconds. In the amalgamating barrel the pulp can be in contact nearly as many minutes. Thus a larger percentage of extraction may be expected. By grinding in cyanide solution either dilute or standard strength, the gold will be cleaned and in better shape to amalgamate than in ordinary stamp-mill practice. It is true that the copper plates will have a tendency to harden and the amalgam crumble, but the amalgam

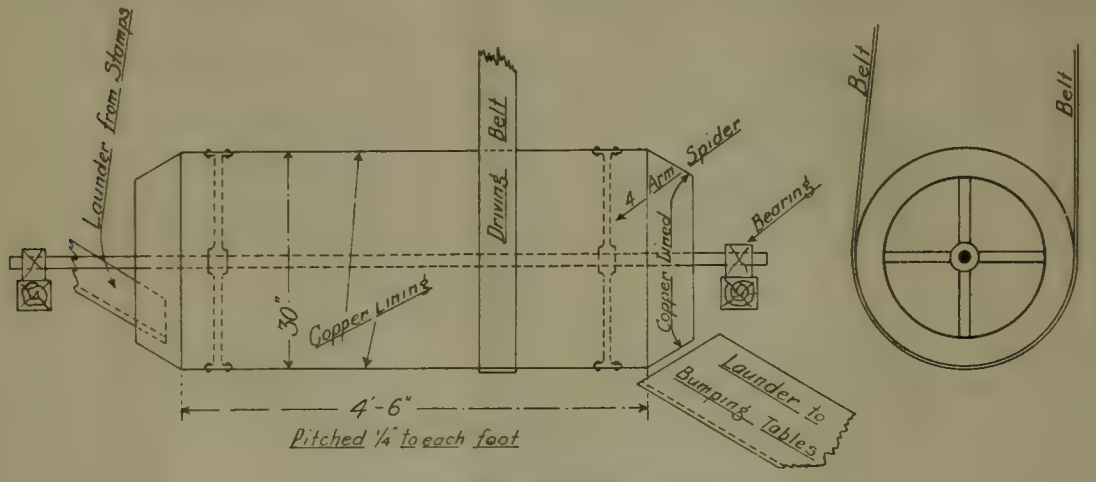


Fig. 4. Amalgamator, Ruby Mill, Ward, Colorado.

cannot get away. It will be caught in the cyanide plant.

It will work out in a number of cases that because of the fine grinding the extraction by amalgamation will be so large that there will not be enough gold left in the tailing to warrant the cost of cyaniding. The most general occurrence of gold is either free gold, or gold enclosed in pyrite. In the case of the pyrite the gold is generally conceded to be mechanically intermixed rather than in chemical combination. That being the case, if the particles of pyrite be ground fine enough the gold should be liberated, and amalgamation alone will be sufficient. In an existing stamp-mill the fine-mesh screens can be cut out, but with 6 or 8-mesh screens the pulp should be sent to the tube-mill, and thus the duty of the stamps will be increased 15 to 25% or more; all at a less cost per ton. In the old Ruby mill a few miles west of Ward, Colorado, is a rotating amalgamating device. See Fig. 4. This mill has been shut down for a number of years, but I understand the amalgamator worked very satisfactorily. The ore was ground by steam stamps, passed through the amalgamator, and over Gilpin County bumping tables.

Discussion

[redacted]

Laboratory Work in Secondary Schools

The Editor:

Sir: I am engaged part of the day in imparting elementary laboratory instruction in chemistry and physics to the boys and girls of one of our secondary schools. I have full power in my choice of what shall constitute the curriculum, the end in view being a maximum amount of mental training by manual training and in practical subjects with a minimum amount of "dead wood." Inasmuch as the course includes assaying and kindred subjects, it occurs to me that a large number of your readers being practical men, should be in a position to give valuable advice on this subject. With a view to starting a discussion, I am appending a set of questions, which I hope will elicit some information from your readers.

1. Does laboratory work in combination with text-book lessons afford the same amount of mental training as the more academic branches of elementary instruction? If there develops a different line of mental training, what are the advantages and disadvantages of laboratory work from a practical standpoint?

2. Does laboratory work afford the same degree of manual training as instruction in a wood-working or metal-working trade, that is, carpentering, cabinet-making, blacksmithing, or tinning? What would be the value of laboratory work taken in conjunction with one of these trades?

3. Is instruction in assaying much improved by preliminary courses in elementary chemistry and analysis? What other courses would be advantageous in conjunction with assaying in an elementary school?

4. Is a knowledge of elementary chemistry and physics of any great practical value to the average pupil, that is, to the boy or girl not expecting to pursue the studies any further or to engage in any pursuit depending primarily upon chemistry and physics? For that matter, is the proportion of occupations or trades in which a knowledge of elementary chemistry and physics is of some value, great enough to warrant the average boy (or girl) pursuing such a course at school? Is this proportion increasing or decreasing?

5. Does the education which a boy may receive in a laboratory tend to wean him from the manual work which he may be called upon to perform? For example, to the boys behind the plow, is the increased interest in their work, due to a knowledge of the relations of plant growth to the chemical ingredients of the soil, more than offset by the additional tediousness of manual labor to "those who have been educated away from it"?

6. Is laboratory work apt to be of practical value [redacted]

7. Is the amount of work that is done in the laboratory of an unpractical nature, or devoted to the [redacted]

8. How much [redacted]

[redacted]

San Francisco, California, December 16.

Superficial Indications of Ore Shoots in Depth

The Editor:

Sir: The recent contributions by Messrs. Storms, Janin and Gordon in the *Mining and Scientific Press* of October 22, November 19, and November 26 respectively, and entitled "Superficial Indications of Ore Shoots in Depth", are interesting and a step in the right direction. I do not know of anything that could be more helpful to the prospector than a discussion of this kind by men of wide experience and who naturally are more keen observers than the average miner, especially the one whose whole interest is centred on his day's pay and what a glorious time he is going to have after he receives it. Mr. Storms' contention that "gulches, or natural depressions crossing the strike of the lode or vein, are the physical expressions of disturbances beneath the surface, and it is rarely, if ever, that an ore-shoot will be found to extend from solid unbroken ground beyond such surface evidence of disturbance", I have found here in Arizona, and elsewhere, to be warranted. Especially have I noticed this phenomenon where a vein leaves an anticline and enters a syncline; it either becomes barren, or nearly so, or feathers out. It seems natural that where a lode traverses unbroken ground and continues uninterrupted for a long distance, that there should be hope of continuity in depth. Quoting from Mr. Lindgren: "In considering the probable permanency of a given vein, its general character must be taken into consideration. Continuous, well defined outcrops and wide bodies of quartz are in general good indications of the maintenance in depth, as is also any evidence of strong faulting and movement. A fissure which can be definitely proved to extend only a short distance will, in all probability, be found to be correspondingly limited in depth". But as there are exceptions to all rules, so there may be in this, but up to date they are scarce and far between. Another matter I would like to draw attention to is the alteration of the country-rock along veins. This may not be a direct indication of continuity in depth, since most superficial alteration is due to weathering, yet that by chemical action is not, and can only have taken place at great depth, and under great heat and pressure. It is therefore not unreasonable to believe, where such alteration characterizes the wall-rocks of a mineral vein, that its presence is a good indication of continuity in depth.

I am only a miner and prospector, and not a mining engineer or geologist, but could not refrain from expressing my pleasure and appreciation of the matter so ably advanced by the writers mentioned above, and I am sure that such a discussion and its continuance can only be of benefit to those who read it.

H. C. Mueller.

Quartzite, Arizona, December 15.

Avino Mines Company

The Editor:

Sir—I have been interested in the remarks contained in the letter of your London correspondent, printed in the issue of October 8, touching the Avino Mines of Mexico, and the subsequent discussion by Mr. Nichols and Mr. Channing, because I at one time, ten years past, made an examination of the Avino mill. I believe I will not be violating professional ethics in supplying a bit of the data which I have, and I may be able to throw some light on this interesting problem.

The following analysis, furnished by the chemist, was of the ore treated in March 1901:

	Per cent.
Insoluble	71.6
Alumina soluble in acid (Al_2O_3)	2.9
Lime (CaO)	0.3
Iron (Fe)	7.3
Zinc (Zn)	1.8
Lead (Pb)	5.2
Copper (Cu)	1.65
Sulphur (S)	5.6
	96.35

From this and other analyses and careful examination of the ore, I considered the mineral composition to be as below, essentially quartz with silicates, and probably some hydrous silicates, of the bases.

	Per cent.
Silica	66.7
Ferrous oxide	4.6
Soluble alumina	2.9
Insoluble alumina	4.8
Lime	0.3
Pyrite and marcasite	5.75
Galena	4.20
Chalcopyrite	3.33
Zincblende	1.89
Cuprite and malaconite	0.83
Malachite and azurite	0.18
Chalcocite, bornite, etc	0.23
Cerussite	0.95
Anglesite and other lead minerals	1.00
Smithsonite and other zinc minerals	1.00
Argentite	0.06
	98.12

The remaining 1.88% consists probably of alkalies with possibly some combined water, resulting from the decomposition of the porphyry, together with traces of manganese and magnesia. At that time the mill included jigs treating three sizes of material, followed by Wilfley tables and an experimental canvas plant. The 'coarse jigs' treated material between 5 and 3¼ mm., the 'medium jigs' from 3¼ to 2 mm., and the 'fine jigs' from 2 to 1 mm., the tailing from all of these machines going to waste. The clean galena carried 1.7 kg. silver per ton, and the clean chalcopyrite about the same. Zincblende as pure as could be picked carried 2.7 kg. silver per ton. The pyrite furnished an interesting example of precious metal occurrence, in that the portion which was saved on the coarse jigs carried only 0.15 kg., while that saved on the Wilfley table contained 2 kg. of silver per ton. From the above analysis it will be seen that the Avino ore was, in 1901, quite complex, and its treatment no simple problem. Brief investigation showed the gross saving on the coarse jigs did not pay the cost of power and water necessary for their operation. An examination of the tailing pile showed at once losses from three principal sources: (1) included grains in tailing from both jigs and Wilfleys; (2) fine grains in the finer tailing; (3) slime. The first loss was by far the most important, the included grains being found in tailing as fine as 40 mesh. This was doubtless a result of the change from the original design of the mill which had included re-grinding with Chilean mills, but the machines purchased, of local design, had been thrown out. My investigation satisfied me that on ore of the character coming to the mill at that date, given proper crushing followed by the necessary re-grinding and with efficient machinery for treating the fine, the recovery could be approximately doubled. I believe nothing was done toward making the needed changes, although I am not familiar with the history of the property. I have been told that several years later Mr. Nichols reached conclusions similar to my own, and in the last annual report of the present manager, R. H. Jeffrey, I read with interest this paragraph concerning Mr. Woods' tests: "It was clear from the earlier tests, the results of which have been reported, that finer grinding was necessary to liberate the metallic particles carrying values from the matrix; a 40-mesh screen was therefore adopted."

Geo. A. Packard.

Butte, Montana, December 15.

Climatic conditions undoubtedly change in long periods of time. In California during the later Tertiary age the climate was wholly unlike that of today. There are few large rivers in California, and these are in the broad level valleys. All mountain streams are found in deep narrow ravines, with heavy grades. In the period during which the ancient, now 'dead,' rivers formed, the streams carried vast amounts of gravel, and even boulders were moved along by the currents of those great streams. The channel of the Hidden Treasure mine, on the Forest Hill divide in Placer county, is 1600 ft. wide, and some of the channels near Dutch Flat and Gold Run were even larger than this. In the Happy Valley channel, near Mokelumne hill, in Calaveras county, large boulders were found with comparatively fine gravel, several feet above bedrock, showing that the streams of those days had both great volume and heavy grade.

Missed holes are the ever present danger of the miner, and often difficult to detect. A miner seldom runs into more than one during his lifetime.

Concentrates

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

The free atmosphere weighs at the rate of 1 lb for each 12 cu. ft. at sea-level at 32° Fahrenheit.

A magnetized iron rod is useful in removing from the drill hole pieces of drill steel broken from the drill-bits.

In hydraulics 550 foot-pounds per second is taken as the equivalent of one horse-power (33,000 foot pounds per minute).

Glaucophane is a blue variety of hornblende. Though abundant in the Coast Range of California, it is not so elsewhere in the West.

Native antimony is not unknown; it occurs in at least two localities in California, one in Riverside county, near Corona, the other in Kern county in San Emedio canyon.

Never close valves in a water-line hastily, as the sudden arrest of the moving column of water produces what is termed water hammer, which if very severe may burst the pipe.

Gold occurs in beach sands at several places along the California coast, but none of these deposits has ever proved profitable, though many and expensive attempts have been made to work them.

Iron sulphide concentrates can be reduced to matte in the reverberatory furnace, only the addition of a small amount of copper in the form of high-grade ore being necessary to act as a carrier of the gold.

If the amalgam does not retort up to expectations, the natural conclusion is that the expectations were not justified by facts. The disappointment may be due to any of several causes, most often to failure to properly clean the amalgam before retorting.

Quartz-mill tailing makes good mortar if not too fine, and if it is practically free from sulphide. If the latter be present it will decompose and the acid will attack the lime, forming an efflorescence of calcium sulphate, and it may disintegrate the mortar.

One per cent metallic tin in an ore is 20 lb. per ton of ore, and at present prices is equal to about $8 per ton. There are few veins of good size that carry more than $8 per ton in gross value. Neither the mining nor the metallurgy of tin is difficult, but the discovery of a profitable mine is.

Pyrite is nowhere utilized as fuel except in what is termed 'pyrite' or 'pyritic' smelting. In this process the sulphur of the pyrite supplies a portion of the fuel, only a relatively small amount of carbonaceous fuel, coke, being added, usually about 7 to 10 per cent.

That an orebody go down to great depth is not nearly so important as that the ore be of profitable grade even if it occur entirely as a superficial deposit. Such orebodies have the advantage, at least, of offering no incentive to expend large sums in the search for more ore in depth when the deposit is exhausted.

The usual measurement of quartzose orebodies is 13 cu. ft. per ton, but this varies with the percentage of sulphides present, and their kind. Heavily sulphuretted ore requires considerably less than 13 cu. ft. per ton. Homestake, South Dakota, unoxidized ore, containing about 10% finely disseminated pyrite and pyrrhotite, requires but 10 cu. ft. per ton.

Rapid drilling by hand is not accomplished by use of heavy hammers and forceful blows, but by hammers of proper size handled by men who know how to strike the blow that will cause the drill to cut and keep the bottom of the hole clear so that the drill is working on solid rock and not on a lot of loose fragments. This is an art and is only learned by experience.

Polaris, the North Star, is probably the star most familiar to all surveyors and to most other persons. It is interesting, therefore, to know that Polaris is really three stars, though appearing as one, even through ordinary telescopes, but by means of the great Lick telescope on Mount Hamilton, California, it was learned some time since that it is comprised of three distinct stars which revolve about each other.

Concentrate produced in quartz-mills often contains a noticeable amount of sand and slaty material, which is of lower density than the sulphides with which it is mingled. When this occurs there is something radically wrong in the work; either the concentrating machine is not adjusted properly, it is over or under loaded, or the operator does not fully understand his business. Another, and perhaps the most common cause of dirty concentrate, is the attempt to make a separation of sulphides from gangue without sizing. Good work cannot be done if the pulp be not first sized. Some millmen overcome this obstacle in a measure by running the concentrate from several machines over one, recleaning it, but this is a makeshift which sizing and classification will obviate.

In the lead blast-furnace, when copper occurs in the lead ore, the object is to cause the copper to pass into the matte, which it does as cuprous sulphide, so long as there is sufficient sulphur present to form this copper matte. Where copper, iron, and lead, are all present in the charge, the copper must first be satisfied in its affinity for sulphur, the iron and lead taking up what remains. If there is not enough sulphur present to take up all the copper as matte, the copper will form an alloy with the lead, sink to the bottom of the well, and will there, in all probability, close up the passage of the lead-well. The flux will vary with the silica, lime, iron, and other minerals in the ore. The relation of sulphur to copper is the principal thing in these charges of mixed ores.

Special Correspondence

MEXICO

Competition Among Custom Smelters.—Operations in Hostotipaquillo District.—Electric Power.—Interest in Taxco District, Guerrero.

The custom smelting concerns of Mexico are competing for the ores of the Republic, and as a consequence operators are securing more favorable terms than formerly. The agreement to respect one another's territory, which for a long period was lived up to in a way unsatisfactory to mine owners, has been abandoned. Silicious ore that will stand shipment is scarce, and some contracts for such ore are being made at prices that allow little margin for smelting. This active competition probably will continue until there comes a material increase in the production of shipping ore. The Aguascalientes plant of the A. S. & R. Co., the largest of the 'trust' smelters in Mexico, is now treating only about 15,000 tons per month, or one-half its tonnage capacity. The Hostotipaquillo and Etzatlan power lines of the Chapala Hydro-Electric Co., of Guadalajara, will be

Amparo Mine Near Etzatlan.

established in January. In the former district power will be immediately received by the El Favor Mining Co., and in the latter by the Amparo Mining Co. At El Favor a 20-stamp concentrating and cyaniding plant was completed late last year, and has since been awaiting the transmission of power. Recently two additional tube-mills and other equipment were installed, and when the mill begins operating it will treat about 125 tons of ore per day. A big tonnage has been proved in the El Favor mine, and stoping will be commenced as soon as the mill is started. The current will be transmitted from the transformer station of the El Favor company to the Casados, Mololoa, and Mirador mines, the Amajac custom reduction works, and the Marquetas plant of the Virginia & Mexico company. The Mirador Mining Co., controlled, as is El Favor, by the Maloney interests of New York, will install reduction machinery adjoining that of El Favor, using the same building. For this purpose 15 stamps, concentrating, and cyaniding equipment have been ordered. Time will be saved by this arrangement, and there will be economy in operation. The Mirador properties are but a short distance from the El Favor mill.——The Virginia & Mexico company, which built the first reduction plant in the Hostotipaquillo, has suspended operations, the high percentage of manganese in the ore having prevented a satisfactory extraction by concentration and cyanidation. A tentative arrangement was made whereby the Virginia & Mexico plant could be used by the Espada Mines Co., operating near Marquetas, but the arrangement has not yet been approved by the former company.——The Mololoa mine, a widely known antigua of the district, has been taken over from the Mololoa Mining Co., a Toronto organization, by W. M. Mathews, of Hostotipaquillo. A body of high-grade ore has been opened, and shipments are being made.——The Magistral Ameca Copper Co., of Los Angeles, has shut down its concentrator in the Ameca district of Jalisco, so the plant can be enlarged to give it 150 tons capacity. French interests recently purchased a large block of stock in this company.——The Porvenir tunnel of the Tajo Mining Co., San Sebastian district of Jalisco, on which work has been in progress for three years, has cut the old Tajo vein at depth, in which ore assaying from 2 to 6 kg. silver per ton was found.

There is promise of much benefit to the old Taxco district of Guerrero in the plans of Chicago men to give it rail connection with the Balsas line of the National Railways at Naranjo. The Taxco Naranjo-Guerrero railroad has been incorporated under the laws of Arizona to operate under a State concession granted to F. E. Olendorf, a mining man of the Taxco district, and it is expected to have the line in operation before the end of 1911. It will be a narrow-gauge road, and about 30 kilometres in length. The grades near Taxco and Naranjo will be heavy. The road will greatly facilitate the shipment of machinery, supplies, and mine and mill products. The Taxco Mines of Mexico, Ltd., the British syndicate now in control of the old Rosario properties, and which started development last June, is now developing ore reserves. The present reduction plant is to be remodeled and enlarged. The Espiritu Santo Mining Co., of Mexico City, owning some of the famous antigua properties of the Taxco district, is regularly shipping high-grade ore, and has a big tonnage of milling ore in the mine. A cyanide plant of 150 to 200 tons capacity will be built. Plants for concentration and cyanidation of 100 tons of ore per day are projected by the Cedral-Lajuela Mining Co., of Boston, and the Mora y Milagro Co., of Mexico City. The Sultepec Light & Power Co., now transmitting current to the Zacualpan district of the State of Mexico, has plans for extending its line to the Taxco district. The supplying of power to Taxco mines and mills also enters into the plans of a company recently formed to generate power on the Balsas river.

MELBOURNE, AUSTRALIA

Bullfinch Boom. — State Coal Mine. — Profits of Mt. Lyell. — Labor Problem at Broken Hill.

The great event recently was the discovery of ore at the Bullfinch claim near Southern Cross, the Yilgarn district, Western Australia. This has attracted much attention, and a syndicate of stock exchange dealers in Adelaide has obtained leases adjoining the Bullfinch. W. J. Loring, of Bewick, Moreing & Co., and Richard Hamilton of the Great Boulder have testified to the richness of the ore on the Bullfinch lease, and a boom has resulted. Newspapers that should have known better lent themselves—to the flutter, and so a frantic rush of speculators into the Adelaide market took place. In Melbourne, *The Argus* kept its hand on the safety-valve, and checked most of the attempts, only half a dozen flotations being carried through. When it is understood that many of the companies were floated to deal with ground into which not a pick had been put, and when the length of the shoot of gold was undetermined, the stupidity of the boom can be measured. The largest company promoted in Melbourne had an issue of 200,000 shares, of which the promoters took 60,000 for £7500 cash, for a block of leases, the main merit of which was that they had been pegged out by Doolette and Shallcross of the Bullfinch mine. It will be luck indeed if the outcrops should prove to carry profitable ore. The State Government of Western Australia

has been declared on preferred stock, having given out a half-hearted warning that dividends have gone too far. At the Boston Copper & Coal Mining Co. meeting the Lake Superior situation was not discussed. Incidentally, Gen. Leonard, although one of the Copper Trust directors, was not present. It was to be expected if Mr. Morgan had to be an exception.

The price of lead is steadily on the boom and prices at New York are declared the highest since the days of Secretary Blaine's reciprocity treaties with Mexico. In the first place Senator Aldrich of Rhode Island, Republican Whip of the Senate, is reported to be ready to accept a small export duty on lead ores and bullion to help the tariff revision. In the next place the Mexican Congress has just passed a bill imposing a duty of 2 cents per kilo on lead ores and bullion. This will go into effect January 1, 1911. Mexico has been shipping about 40,000 tons of lead per month to the United States. The price was 4.50c. per lb. in New York on December 15, as against 3.75c. on December 1, and 3.50c. on November 1. Lead is selling at 4.50c. per lb. in London, and the London Metal Exchange has declared that the position of lead is very strong. The London Metal Exchange has also declared that the position of tin is very strong. The Straits Trading Co. has declared a dividend of 50 per cent. for the year, and the Consolidated Tin Mines of Nigeria has declared a dividend of 10 per cent. for the year. The Mexican Mines of Mexico has declared a dividend of 10 per cent. for the year. The Mexican Mines of Mexico has declared a dividend of 10 per cent. for the year. The Mexican Mines of Mexico has declared a dividend of 10 per cent. for the year.

The Mount Lyell Mining & Railway Co. of Tasmania, the greatest Australian copper producer, has had to knock off the bonus it has been paying to its shareholders over and above the usual dividend. The reason given is the low price of copper, which averaged about £55 10s. for G. M. B. The profits were down to £90,000 for the past six months as against £115,000 for the previous term, when the average price of copper was over £59. While financial results have been disappointing, from a mining standpoint the property is in a better position than it has ever been. This is strong testimony to the splendid metallurgical skill and enterprise of two American mining engineers, Robert Sticht and A. L. Dean. The Mount Lyell orebody consists of a huge pyritic mass, and the company is fortunate in having also the North Mount Lyell, a highly siliceous deposit averaging 6% copper, whereas the Mount Lyell ore is under 0.7%. At one time it looked as if the North Mount Lyell deposit was likely to give out, but at the 850-ft. level the ore shoots enlarged beyond expectations, and several of them have been proved down to the 1100-ft. level. Therefore, the mine reserves now amount to 1,000,000 tons. This estimate is on a conservative basis, and a reasonable conclusion is that there is 18 months' work in sight down to 1100 ft. This level has been only partly opened, and the interesting feature is that the grade of the ore still remains at the average of 6%. The Mount Lyell ore serves simply as a flux for the North Lyell ore, and some of the pyritic ore is used for the manufacture of superphosphate, a business in which the company is engaged on a large scale in Victoria, South Australia, and Western Australia. A portion of its profits and some of its reserves have been absorbed in putting up superphosphate works in the different States, but as that expenditure is now at an end, the money will be used to build up the reserves again and probably to return to the old scale of dividend. At Broken Hill the labor question is beginning to cause anx-

ety. The Proprietary group of 3,000 acres, from which the 1,000 tons per day of concentrates at the Central mine are to be obtained, is to be worked by the Broken Hill Proprietary Co., Ltd., which has been formed to take over the assets of the Broken Hill Associated Smelters, Ltd., of the Sulphide Corporation, Ltd., and of the Central Broken Hill Co., Ltd. It is to be managed by Sidney Kidman, of Adelaide, who is reported to be acting in behalf of the Commonwealth Government. This would be the first time that the Government has gone into mining. The Broken Hill Proprietary Co., Ltd., has been formed to take over the assets of the Broken Hill Associated Smelters, Ltd., of the Sulphide Corporation, Ltd., and of the Central Broken Hill Co., Ltd. It is to be managed by Sidney Kidman, of Adelaide, who is reported to be acting in behalf of the Commonwealth Government. This would be the first time that the Government has gone into mining. The Broken Hill Proprietary Co., Ltd., has been formed to take over the assets of the Broken Hill Associated Smelters, Ltd., of the Sulphide Corporation, Ltd., and of the Central Broken Hill Co., Ltd. It is to be managed by Sidney Kidman, of Adelaide, who is reported to be acting in behalf of the Commonwealth Government. This would be the first time that the Government has gone into mining.

DENVER, COLORADO

Committee on Legislation.—Franklin Gutterman's Speech.—Cripple Creek Operations.

The coal-mine disasters during the last few months have aroused public attention to that industry. Governor Shafroth has appointed a committee to investigate the conditions in the several coal-mining districts of the State, and to recommend needed legislation. The report of the committee is expected in the early part of January, so that action may be taken at the session of the Legislature. It will be interesting to note the recommendations that the committee may make up, as it is of those very men who are not in particularly close touch with coal interests. The proposal is one of the great importance to be acted upon hastily, and it is suggested that these recommendations should be mailed to every coal-mine operator and mine-owner in the State, asking for his views upon the same and for any additional suggestions which he might care to offer. This would take considerable time, but when the answers were all in and summarized, there would be at hand a mass of information from which a very valuable statute might be drawn. The work which the Denver branch of the American Mining Congress is doing in shaping legislation needs special mention at this time. If this organization will only broaden the scope of its activities to include coal mining and its legislative needs, as well as metal mining, it will render a great service to the State.

No public utterance, in recent years, on Colorado mining has caused as much discussion as the speech of Franklin Guiterman, local manager of the American Smelting & Refining Co., before the American Mining Congress in Denver. Mr. Gulterman told some very plain truths about the decline in mining in this State for the past ten years. Correspondents for the local papers have been busy since that speech offering suggestions as to the cause of this decline. The A. S. & R. Co. has naturally come in for a great deal of criticism, and some praise. In discussing reasons for the many idle smelting plants throughout the State, few writers have been willing to concede that their building may have been ill-advised in the beginning or poorly managed in the end. The Forest Service has also received its share of abuse. To one not familiar with the actual conditions, it would appear that a prospector could not enter a National Forest in Colorado. This is absurd and Lode mining. There is no place where prospecting can be done to better advantage than on a National Forest when a man really means business. One of the strongest deterrents to prospecting in Colorado is the fact that so many of the good prospects have been patented and now lie idle. There is not the same incentive that there once was. Should the land laws of the country be so changed that it would be necessary for a claim holder to develop his property in a consistent, intelligent manner, within a given time, then there would be some activity. This holding a claim simply to get the unearned increment from some other fellow's work is one of the reasons for the present predicament.

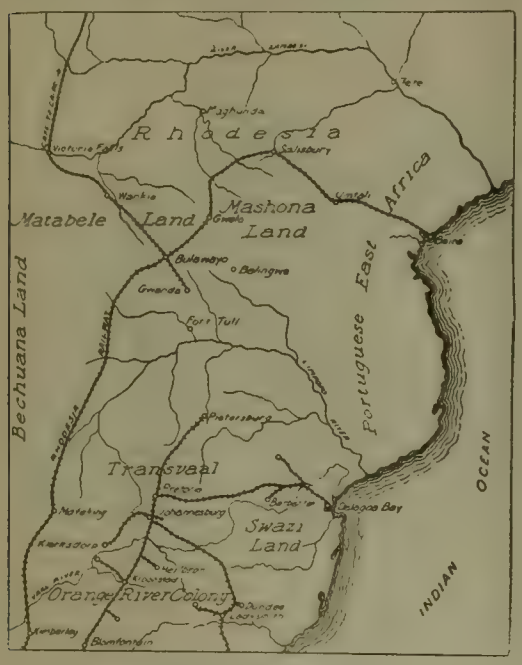
The contract on the Cripple Creek drainage tunnel has been completed, and the El Paso company is now driving the

tunnel ahead on company account. No clearly defined water-course has been cut as yet, although the tunnel is in very wet ground and makes about 2500 gal. per minute in excess of what comes from the El Paso drill-hole. The November production from the district showed a larger tonnage with a lower average value than usual. The gross bullion value was $1,376,697. Many of the mining companies which intend to resume operations on company account are considering the establishment of a change-room system. It is the surest way of dealing with the high-graders. Honest miners will not object to having their personal comfort provided for, and if others are so particular that they cannot abide shower baths, lockers, and dry clothes they are surely too finical to work underground.

BULAWAYO, SOUTHERN RHODESIA

Historic Celebration in Rhodesia.—Growth the Result of Mining.—Record of Globe & Phoenix.—British South Africa Company.

At the commencement of this month (November 1910) Rhodisia celebrated her 'coming of age.' Twenty-one years ago a hardy band of pioneers took possession of Mashonaland, a country which was then an absolute terra incognita, a land which only a few daring hunters, traders, and explorers, and a few enthusiastic missionaries had visited. Later came the Matabele war, the flight of Lo Bengula, the



Map of the African Goldfields.

savage king, and the occupation of the land of the Matabele. Twenty-one years ago the wild 'veld' clung around Mount Hampden. Today Salisbury stands there, the capital of a prosperous country, a town with miles of streets, imposing law courts and administrative offices, a dozen and a half good hotels, a theatre, etc. Bulawayo, built almost on the site of Lo Bengula's old slaughter kraals, is the proud capital of Matabeleland. It has grown more rapidly even than Salisbury, and as I write these lines I may take my eyes off my pen for a moment and see great broad streets decked and festooned with bunting, for the King of England's uncle will visit Bulawayo next week.

Nothing has contributed so much to the development of the country as mining. Up to date Rhodesia has produced gold, coal, silver, chrome iron ore, lead, diamonds, and other precious stones, wolframite and scheelite, copper, asbestos, and antimony of a total value of over seventeen and a half million pound sterling. And it is perhaps fitting that at a time when the country is celebrating her coming-of-age anniversary, the premier mine of Rhodesia—the Globe & Phoenix—should get up a record return of £65,000 as the result of one month's production. Never before has any single Rhodesian company produced such a large amount of gold in one month, and the achievement of the Globe & Phoenix mine not only eclipses all other Rhodesian outputs for individual mines by at least £15,000, but establishes the fact once and forever that Rhodesia is not merely a country of small rich quartz shoots of no enduring character, but that it contains at least one large mine as well as a number of small ones.

As a matter of fact Rhodesia contains many large properties, mines which may be relied on to operate equipments of 50 or 60 stamps for several years to come—mines like the Shamva, the Falcon, the Gold Schists, and the Giant. There are, too, numerous properties which are as yet in their veriest infancy, but where orebodies at least 35 ft. in width are being exploited. I know of two or three such occurrences which assay from $4\frac{1}{2}$ to $5\frac{1}{2}$ dwt. right over this width and which are admirably situated with regard to cheap working facilities. As the country opens up, the cost of mining, reducing, and treating ores in Rhodesia will of course diminish greatly, and I predict that in the very near future a great deal will be heard of those low-grade Rhodesian deposits.

Although the Chilean mill has found but little favor in the Transvaal a number of these reducing machines are employed in Rhodesia. Some of the most important mines in the country are employing them and are reported to be obtaining very satisfactory results from their use. Hitherto all the Chileans at work in the country have been run on the high-speed principle, and it is therefore interesting to learn that endeavors are now being made to introduce slow-speed Chilean mills in Rhodesia. It is contended—and with reason—that to many of the smaller mines of Rhodesia situated at a considerable distance from the railway a minimum repairs and renewals bill is an absolute essential, since in many instances the difference between a high and low renewals account may well represent the difference between profit and loss to the workers of the mine in question. The results that will accrue from the operation of slow-speed Chileans in which large capacity is obtained by grinding the ore under great pressure instead of at high speed and little pressure are certain to be followed throughout the country with great interest.

While practically every important South African mining house secured interests in Southern Rhodesia last year or early in the current year, it has been noticeable that until quite recently the great firm of H. Eckstein & Co., in whom the South African interests of Wernher, Beit & Co. are vested, had rather held aloof from acquiring any properties in either Matabeleland or Mashonaland. Wernher, Beit & Co. have, of course, a large stake in the country represented in the firm's participation in the British South Africa Co., and the Eckstein's have for some time past had a local representative with headquarters in Salisbury, Mashonaland. But it is only within the past month or two that the company has actually acquired separate and individual interests in Rhodesia, and it is of course a 'bull point' for the country that at last the Ecksteins have invested considerable sums of money in acquiring blocks of claims and options in both Matabeleland and Mashonaland. A few days ago interests in the Mazoe district to the north of Salisbury were acquired, and I am now given to understand that the firm has under consideration the taking up of certain properties in the Gwanda district to the south of Bulawayo. Around Gwanda numerous important discoveries have been made in schist and scorodite within the past few months, and in addition to the Ecksteins other important South Africa mining houses have representatives busily engaged in the inspection of properties in this portion of Matabeleland.

Very good results are attending the development of the Antelope Gold mine situated about 60 miles to the south of Bulawayo. The company is controlled by the Rhodesia Exploration & Development Co., and Abe Bailey is one of the largest shareholders in the property. A sound scheme

of development is being carried on at the mine which when working conditions permit is in charge of a superintendent. Eight stamps of the type used in Rhodesia have been installed and have been running for some time. Several veins have been discovered and opened during the last two or three months, but prospecting the veins with diamond drill is now receiving consideration. The property will work from 40 to 60 men and will be the farthest prospecting camp at work in Rhodesia. They will be connected by telephone but I am unable at present to state what the cost of the plant will be.

TORONTO, CANADA

First Selling of Porcupine Stocks — Dividends of Cobalt Companies — Nipissing Output — Codification of Mining Laws

The first important offering of Porcupine mining stock to the public was made this week when shares of the Hollinger Gold Mines Ltd. which had been underwritten at $3.50 were placed on the market and sold rapidly at prices ranging from $4 to $4.50. The Hollinger which is capitalized at $1,000,000 with shares of the par value of $5, was organized by the Timmins McMartin syndicate and owns four claims. A three-stamp mill has been in operation on the property for some time, and it is claimed that enough gold has been produced to pay the cost of development to date. Orders received from a distance indicate that the flotation has excited widespread interest. Several of the leading Cobalt companies have recently paid big dividends which have tended to keep up prices of these particular stocks, but the general list has been weak, non-dividend issues steadily declining. La Rose has announced its regular quarterly dividend of 2%, only, to the disappointment of those who were figuring on the restoration of the old rate. The directors announce their adherence to the policy of creating a large cash reserve before increasing dividends. The Nipissing pays the usual quarterly 3%, with a 2½% bonus. The Buffalo has declared three dividends, amounting to 15%. Crown Reserve, in addition to its quarterly 6% dividend, gives a 2% bonus. Trethewey has declared a division of profits equal to 10%. The Temiskaming has declared a 3% quarterly dividend and a 5% bonus. The Right of Way pays its customary quarterly 2%. This is a favorable showing, and, taken in connection with the market prices of the stocks, would seem to indicate an upward movement. The shareholders of the Trethewey are to be asked to sanction an increase of the capitalization from $1,000,000 to $2,000,000 by the issue of treasury stock to be used for the acquisition of other properties. —The Peterson Lake and Nova Scotia companies, which have been contending over a strip of valuable territory, have arrived at an agreement under which the disputed area will be worked and the proceeds retained by Peterson Lake until the courts decide how it shall be apportioned.——A. M. Thomsen, of California, who has a conditional lease of the Green-Meehan property, is having it unwatered preparatory to a thorough inspection. He is of the opinion that the mine may have been badly worked and the orebody overlooked.——Some good finds have been made at the Beaver, where development has been in progress during the last quarter. In cross-cutting from the main shaft on the 300 ft. level the big vein was cut at that depth, yielding good silver ore. About 275 ft. north of this point a 7-in. vein of smaltite was opened. The November output of the Nipissing from four shafts amounted to $200,851, of which $84,000 came from the Fourth of July shaft alone. The ore reserves were increased during the month.——The Floyd Mining Co., of Cobalt, and the Otisse-Currie, Elk Lake, have gone into liquidation. —Cripple Creek, situated about 45 miles south of Porcupine, is again attracting attention. Some good work has been done recently, and the reports of high assays of the ore taken out have been received.——The Preston claim, south of the Dome in Porcupine, and adjoining the Foster, is reported to have changed hands for $250,000.——Work on the ex

[illegible] of the Temiskaming & Northern Ontario Railway to Porcupine is being pushed as rapidly as possible.

It is understood that a commercial attaché for the Mexican Consulate in the Canadian Bureau of Statistics in Ottawa, one of the outcomes of the visit of a delegation of the Canadian Mining Institute to Mexico, is to be sent to the Dominion. Sir Wilfrid Laurier, and other members of the Cabinet, at Ottawa, during their visit to Mexico, were invited to appoint a Mexican commercial agent to Canada. [illegible] Adams, of McGill University, Montreal, was chosen president, and Professor R. W. Brock, of the Canadian Geological Survey, secretary of the International Geological Congress. A meeting of geologists and miners was held in Toronto on December 2. The Congress will hold its centennial session here in 1913, and the rule is that the country in which the congress meets shall elect the officials.

DEADWOOD, SOUTH DAKOTA

New Ore-Shoot in Golden Reward. — Mill of Wasp No. 2. — Proposed Smelter for Galena. — The Tinton Mill. — Other Black Hills News.

By the opening of a shoot of ore southeast of any previously known orebody in its ground, the Golden Reward company has added much to its probable productive area in the Bald Mountain district. The shoot is over 1000 ft. long, nearly 300 ft. wide, and 10 to 14 ft. thick. The ore is soft, and contains a high percentage of sulphur and iron. It can be cheaply mined, roasts easily to a perfect cyaniding material, and, if mined in the quantities contemplated, can be transported to the mill at Deadwood at 25c. per ton. It is understood that the C. B. & Q. R. R. Co. has made this rate for 500 tons daily, which is the tonnage the Golden Reward company expects to produce as soon as the roaster and mill are equipped. It is planned to build the roaster at the mine and increase the capacity of the 200-ton cyanide mill at Deadwood to 500 tons daily. The ore-shoot referred to has been tapped from both the Mikado and Union shafts, and development on it is in progress. —The Wasp No. 2 company's new cyanide mill has been started, its former mill having been destroyed by fire last January. The new mill was carefully designed, and is a model dry-crushing cyanide plant of 400 to 500 tons daily capacity. The ore, received from the mine in 5-ton skips, is dumped into a bin above a No. 6 Gates crusher, by which it is reduced to 1½ in., is elevated, passes over a ¾ in. grizzly, then to two No. 4 Gates crushers, reducing to ½ in. size. The ore is then dropped into the crushed-ore bin, and is fed by shaking feeders to four 16 by 36 in. McFarlane rolls- two used as cracking rolls and two as finishing rolls. The finished-ore bin has a capacity of 750 tons, and the ore is charged into six 14 by 32 ft. leaching tanks by a system of six individual conveyors, fed by a conveyor carriage traveling parallel to the ore-bin. Precipitation is accomplished in three steel zinc-boxes. The mill is operated throughout by electricity, supplied by the Consolidated Power & Light Co. of Deadwood. A total of 386 hp., in motors, is installed in the plant. The plant was started on December 1, and up to date has operated satisfactorily.——It is announced that Chicago capitalists have become interested in building a smelter in the Galena district. The proposed plant will contain several of the devices of Paul Danckwardt, one of the pioneers in pyritic smelting in the Black Hills. The principal supply of pyrite will be obtained from the Gilt Edge-Maid mine, where a big body of low-grade concentrating ore was developed last summer. ——Placing the concrete lining in the tunnels of the Homestake hydro-electric plant on the Spearfish river is in progress. The entire 22,000 ft. of 7 by 9-ft. tunnel will be lined to reduce friction and eliminate timbering. Work is also in progress upon the diverting dam and intake. It is expected that the plant will be running by July 1, if there is no delay in the delivery of machinery.——The

Tinton mill, near Nigger Hill, has been shut down for the winter, after a summer devoted largely to experimental work in the mill, and further development of the mine. A large quantity of high-grade cassiterite concentrate was produced during the season and shipped to Swansea, Wales. The mill work was satisfactory, and plans for the coming summer include enlarging the plant and remedying a few defects. The mine is developed to supply a large tonnage, and with tin commanding the present high price, the company is much encouraged in its work.——P. H. Bertschy, who is leasing on the Imperial, at Portland, is shipping his output to the Lundberg, Dorr & Wilson mill, at Terry. The Imperial company recently let a contract for 250 ft. of cross cutting from the bottom of its shaft. This shaft, which was sunk three years ago, penetrates the lower quartzite of the Cambrian, but several thousand feet of work from the bottom failed to find ore. It is stated that the company intends to thoroughly explore for ore from the bottom of the shaft, and that the present contract is but the beginning of what may be anticipated during the coming year.——The Portland company recently purchased the Ajax ground, adjoining the original holdings of the company on the north. The Portland previously purchased the American Eagle, at sheriff's sale, and the Frawley ground, adjoining on the west and north. This gives the company a large area of nearly virgin ground, as well as an excellent mill, which is now undergoing repairs and remodeling, and which is to be started in the spring.

NEW YORK

The Granby Dividend. — Improved Condition of the B. C. Copper Co. — Mill Equipment at Chino and Ray. — The Mines Company of America.—Camp Bird and Santa Gertrudis.

Of the funds recently raised by the A. S. & R. Co., $1,000,000 is to be expended in the betterment of the plant at Baltimore. The Guggenheim forces are assuming the aggressive, not only in the development of copper properties, but in the struggle for supremacy among the smeltermen.——There is some criticism of the Granby dividend. In view of the fact that the life of the Granby is inconsiderable, unless there are discoveries of new orebodies, and that the newly optioned Hidden Creek property will require considerable development before its worth can be determined, it appears that a distribution of any material part of the cash on hand is hardly justifiable. The British Columbia Copper Co. is making a strong effort to improve its position. Some $300,000 has been accumulated as a dividend fund. The cyanide plant at the Napoleon mine, the aerial tramway at the Lone Star, and the enlargement of the furnaces at Greenwood have all been paid for, and the taking over of the Dominion property is practically accomplished. The management states that earnings will show 15% net, and that early in 1911 the company will probably begin distribution on a 12% basis. ——It was originally planned to equip Chino with a 3000-ton concentrator; but present plans contemplate a capacity of 5000 tons. The capacity of the plant on the Ray Consolidated is to be almost doubled. It is one of the incongruities that announcements of this nature must accompany the news of renewed efforts to cut down production. Some of Thos. W. Lawson's enemies have declared many times that no corporation upon which he ever laid hands prospered. Mr. Lawson has as many times argued the question and pointed with pride to what he accounts his triumphs in the way of promotions. His enemies scored again, however, in the recent shut-down of the Balaklala, now controlled by the First National Copper Co. The directors are addressing the stockholders, suggesting the exchange of First National stock for shares in the Aztec Petroleum Co. on a basis of one share of the former for one and a half of the latter. The Aztec Petroleum Co. has lands in the Coalinga oilfield.——The Mines Company of America has resumed paying dividends on a basis of 9%, 22½c. per share quarterly, which is equal to 18% on the present selling price. This company is absorbing the Dolores, El Rayo, both in Chihuahua; the old Mines Company, at Minas Prietas in Sonora; and has recently bought the La Dura. The right to exchange stock expires on January 11, 1911, but so large a proportion has already been converted that the merger is now practically complete.——The Ely Central Copper Co., recently in the limelight by reason of the manipulation of its stock by B. H. Scheftels & Co., was sued by William Bullock Clark, of Johns Hopkins University, on a contract under which Clark was to examine the property and be paid in stock. The contract was broken, and the examination was not made: Clark sued for the value of the stock, at the time of the breach of the contract, and recovered judgment in the Federal Court for $72,966.——The annual report of the Camp Bird shows larger earnings than for any previous year in the company's history. The gross production was $2,720,000. The ore reserves of the mine have for some years been the one critical question, though there never has been a time within the last four years when there was as much as six months supply of ore in sight.——Speaking of the Santa Gertrudis, the company's chairman says: "The Camp Bird has done well for us for nearly nine years, and I may say that the Santa Gertrudis mine prospects are better than when we first brought out the Camp Bird. The engineers report reserves in the Santa Gertrudis of 462,000 tons on December 20, 1909; the net profits from these reserves should be approximately $4,620,000."

Frank Lewis, of Colonia Juarez, has sold his mine, situated near Dos Cabezas, to Juan Terrazas at $70,000. The purchaser holds an option on another mine belonging to Lewis and others.

TEXAS

Mine Development in Llano District. — Tin Mining and Concentrating at Mount Franklin.

Attention on the part of practical mining men is being attracted to the mineral region around Llano by the success of the Llano Gold Mining Co. in the development of its property, situated a few miles from that place. Work has been in progress for the last three years exploiting this mine, and the results of development, apparently, have justified the erection of a 50-ton reduction mill. Such a mill will soon be finished and placed in operation. It is so planned that its capacity may be increased to 200 tons when the ore output has become sufficient to justify the addition to the plant. The company has expended more than $100,000 in development which was carried on to determine the location and extent of the orebody. It is announced by McCarty Moore, manager for the company, that the main lode has a width of 28 ft., between well defined walls; that the ore is partly free-milling, and that average samples taken across the vein assay $15 per ton in gold. The workings have a depth of about 600 ft.——Some development work is being done on the tin mine, situated on the east side of Mount Franklin, 15 miles from El Paso. The mill on the property is in operation, turning out about 50 tons of concentrate, running from 60 to 65% tin, every 24 hours. The concentrate is smelted in the furnace which is operated in connection with the mill. The tin product is shipped to Philadelphia, in pigs of 100 lb. each. There are eight veins of tin upon the property which are now being developed.——J. Heard and associates are developing a claim, situated 42 miles northwest of Toyah and 10 miles north of Boracho, in the foothills of the Guadalupe mountains. The work so far done indicates that a body of good ore will soon be uncovered. It is stated that the ore runs from 40 to 60% zinc, 5% iron, and a trace of silver and gold. It is planned by the owners to erect a concentrating mill as soon as development operations have progressed a little further.——Ore shipments were recently begun by Eagle & Walker from their mine near Alamore, in the trans-Pecos region. The ore contains gold, silver, and copper.

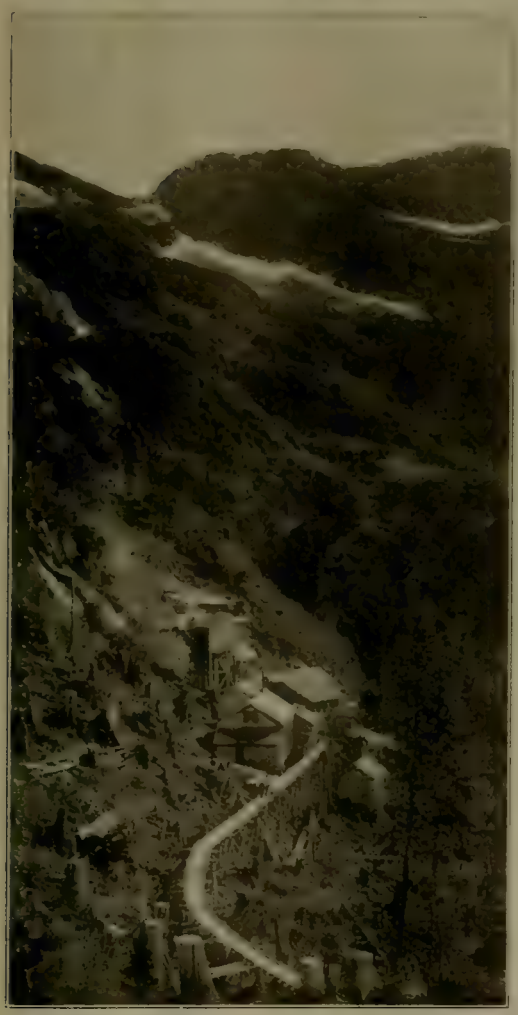
General Mining News

ALASKA

(Special Correspondence.)—The Jumbo mine at Sulzer has made another shipment of ore to the Tyee smelter at Ladysmith, B. C.——There is about 2000 tons of gold ore blocked out in the Goldstream mine and A. A. Wakefield, the superintendent, is preparing to make a small shipment.——Operations at the D mine have been suspended for the winter.

Ketchikan, December 8.

(Special Correspondence.)—The Alaska Industrial Co., owner of the Sulzer mine on Hetta inlet, Prince of Wales Island, made 21 ore shipments to the Tyee Copper Co.'s



Sulzer Mine, Alaska.

smelter at Ladysmith, B. C., during the year 1910, aggregating 15,000 tons. Within the same period 25,000 tons was mined. In the meantime, the property has been equipped with a Sullivan duplex air-compressor and 11 drills of same make. In the work of exploring the ore-bodies with diamond-drills, 38 holes were drilled, in each of which ore was found. The drill-hole made from the floor of the lowest level showed the ore to persist to a depth of 200 ft., the better grade being at the bottom. The plan now is to drive lower adits which will open the mine 500 ft. deeper. Chas. A. Sulzer, general manager for the company, states that such adits are to be driven during the year 1911. The company has been mining and shipping continuously since 1906, and now contemplates operating on a larger scale than heretofore. It has a hydro-electric plant [illegible] power for all purposes a [illegible] aerial tramway that extends from the wharf to the mine. The ore consists principally of chalcocite in a gangue of calcite, garnet, epidote and limestone carrying [illegible] gold and silver.

Sulzer, December 15.

The report of the Alaska Mexican Gold M. Co. for the month ended November 15 is as follows: Mill time, 3 days. The 120-stamp mill ran 29 days, 5 hr., 31 min.; water power, 10 days, 19 hr., 12 min.; steam power, 18 days, 10 hr., 19 min. Ore crushed, 18,184 tons; concentrate saved, 300 tons. Estimated gross value of free gold recovered, $24,520.70; estimated gross value of concentrate, $22,944. Total production less $20,962.12 due Alaska United G. M. Co., $44,105.58; realizable value, $42,[illegible].38. Operating expense, $31,126.41; net operating profit, $11,[illegible]49.97. Construction expense, $4843.57; yield of ore milled, $2.42 per ton. Stock of broken ore, 8046 tons. Development work, 241 ft. in ore, 268 ft. in waste; assay value of ore, $2.70 to $3.62.

The report of the Alaska United G. M. Co. for the month ended November 15, was as follows: Mill time, 31 days. Ready Bullion 120-stamp mill ran 30 days, 11 hr., 41 min.; water power, 21 days, 15 hr., 54 min.; steam power, 8 days, 19 hr., 47 min. Ore crushed, 20,440 tons; concentrate saved, 371 tons. Estimated gross value of free gold, $24,526.04; estimated gross value of concentrate, $17,801.59; gross realizable value, $40,596.45. Operating expense, $26,533.23; net operating profit, $14,063.22; construction, $3300.79. Yield of ore milled, $2.07. The 700-Ft. Claim 100-stamp mill ran 28 days, 21 hr., 35½ min.; water power, 9 days, 3 hr., 13 min.; steam-power, 19 days, 18 hr., 22½ min. Ore crushed, 16,239 tons; concentrate saved, 280 tons. Estimated gross value of free gold, $21,047.15; estimated gross value of concentrate, $16,603.23. Estimated realizable value, $36,333.40; operating expense, $25,882.85. Net operating profit, $10,450.55; construction, $2491.93. Yield of ore milled, $2.31 per ton. Development work on Ready Bullion claim, 326 ft. in ore, 6 ft. in waste; on 700-Ft. Claim, 168 ft. in ore. Assay value of ore, $0.64 to $5.85 on former, $3.93 to $5.15 on latter claim. Stock of broken ore, 2440 tons on Ready Bullion, 6800 tons on 700-Ft. Claim.

Fairbanks lost nine buildings by fire on December 15, valued at $120,000. While the fire raged, mercury thermometers showed a frigidity of 50 degrees below zero.—— It is reported at Cordova that G. T. Nichols and associates have purchased the Walker-Erickson group of partly developed claims in McKinley lake district, on which development will be continued this winter. The property was sold by B. W. Walker, Tim Erickson, E. S. Malone, and Sam Erickson, who have kept up development for the last three years. They had 200 tons of high-grade ore on the dump at the time of the sale.

ARIZONA

GILA COUNTY

(Special Correspondence.)—The starting of the Miami Copper Co.'s new concentrator, which will be the initial treatment of the low-grade ore in the Miami district, is being awaited with much interest, but it hardly seems likely that its operating can begin on January 1, as announced. The pumping station at Burch is about completed, but there remains over 9000 ft. of pipe to be laid and connected at the concentrator before the plant can be put in operation. The cooling-tower, west of the power-house on the flat north of the Miami townsite, is assuming shape. In the concentrator building the crushing machinery, Deister slime and sand stables, and the electric motors to operate them, are all in position; a force of men is putting in the shafting and arrangements for placing the switchboard. The six 250-ton tanks for handling the concentrate have been finished. Work has been started on the tramway that will be used to haul supplies from the railroad at Miami to the concentrator and mines on the hill. Up to this time all material and supplies have been transferred from the railroad to the tramway built in the canyon southwest of the main works; and the erection

of the dam across the mouth of this canyon will make it necessary to remove the track and buildings from this place, as the company is to use this canyon for the mill tailing. In the underground workings about 80 men are kept busy getting ready for such production as will keep the concentrator supplied with ore after it is started. In the main drifts the timbers are being strengthened and arrangements made for the stringing of the trolley wires for the electric system that will be used for hauling ore to the bins at the bottom of the main shaft. The work on the raises under the ore 'rooms' on the 370-ft. level is in progress, and these raises are being provided with chutes, through which the ore is to pass to the 420-ft. level, where the main haulage system is installed. The three churn-drills which are being operated in the northwestern part of the Miami ground, to determine the extent of the orebody in that direction, are sinking at an average rate of 35 ft. per shift of 12 hours each.

Globe, December 27.

CALIFORNIA

CALAVERAS COUNTY

The 500-ton concentrator and the smelting plant of the Calaveras Copper Co. are expected to be in operation soon after the first of the year.

ELDORADO COUNTY

The Pacific mine, situated within the limits of Placerville, has new orebodies in five different veins at the 500-ft. level, and it is announced that a new mill is to be built on the property, and that the present force of 60 men is to be greatly increased.

INYO COUNTY

The report of the Skidoo Mines Co. for November 1910 shows 1317 tons of ore milled; value of bullion produced, $21,335.89. The operating costs were $7585.66; expenditure for development, $470.20; net profit for the month, $13,280.03.——The Benton cyanide plant is now in operation on tailing from old mills. The Benton properties are in the hands of Remington, Cahoone, Musser, and their associates.

NEVADA COUNTY

Wm. McLean & Co., operating the Republic mine, at Graniteville, have performed a great deal of development work, the latest labor having resulted in opening the vein on the lower adit level.

PLUMAS COUNTY

The Jamison M. Co. is employing 50 to 60 miners blocking out ore and developing. The stamp-mill, which had been inactive two months by reason of the lack of power, was started again last week. The property is situated near Quincy, and is a dividend payer.

SHASTA COUNTY

The Balaklala Copper Co. closed its smelting plant at Coram on December 15, as the result of the demands made by Shasta County Farmers' Protective Association, but it is reported that notice was posted later by R. T. White, the manager, to the effect that the smelter would resume operating on December 28. It is understood that additional apparatus for perfecting the Cottrell system of controlling the smoke and fume is being installed.

SIERRA COUNTY

F. M. Phelps and associates have had a force of miners at work 18 months on the Monte Cristo gravel mine at Downieville, who are now driving on the Belcher channel, in which it is expected soon to open the pay-streak. This shoot on the Belcher proved profitable. The Twenty-One mine, situated at Alleghany, has been opened by an adit on the lode which has a width of 5 to 7 ft.; the ore, assaying $7 to $135 per ton, is mostly free milling. There is close to 900 ft. of stoping ground in the vein above the adit, which is to be extended 200 ft. farther. This lode is the same as that of the Tightner. The Red Star mine, which is said to have the same vein, has an adit 50 ft. in rich ore.

SISKIYOU COUNTY

The Mono mine, 6 miles west of Yreka, was recently sold to Eastern investors represented by R. M. Wade of Chicago. The vendor was the Mono M. Co., for which R. E. Newcomb had been manager. The property is considerably developed from a 550-ft. shaft, and is said to have a 4-ft. vein of ore assaying $15 per ton. The purchasers intend to operate the mine with a larger force than that heretofore employed.

TRINITY COUNTY

(Special Correspondence.)—The 200-ton cyanide plant of the Trinity Gold Mining & Reduction Co., near Carrville, has been in operation ten days, and is giving the best of satisfaction. The ore is delivered to the crushing plant in trains of two-ton cars where it is crushed to 1-in. size by a Blake crusher. It is then distributed to the battery ore-bins by two belt-conveyors with an automatic reversible tripper. The battery bin has a capacity of 1300 tons. The ore is fed to the 8 five-stamp batteries, weighing 1050 lb., by improved Challenge feeders, and is crushed in cyanide solution through 30-mesh screens. The ore averages $5.25 in gold and silver, and 80% extraction is made by amalgamation. A 2-lb. cyanide solution is used. The pulp passes direct from the batteries to four 48-in. double hydraulic cone-classifiers; the sand passing to four 30 by 7-ft. leaching vats, to which it is fed in rotation and distributed by means of a Butters distributer. The slime is thickened in two Dorr thickeners, and a pulp of one-to-one consistence is diluted to three to one with barren solution and then agitated in two Pachuca agitators for three hours. It is then discharged into two other 12 by 25-in. Dorr thickeners, the thickened pulp, of a consistence of two to one, being fed to two Oliver continuous filters, from which it is washed and discharged from the mill. The overflow from the thickeners, leaching-tanks, and Oliver filters is run to clarifying-tanks, where the solution is clarified before precipitation by the Merrill system; the barren solutions, rarely running over 3c., are built up to the requisite strength and pumped back to the storage tank for use again in the batteries. This is one of the most up-to-date cyanide plants in the State. The machinery is all electrically driven, the power being supplied at the company's plant, which consists of a Francis turbine, direct-connected to a 400-kw. generator. The voltage is 4000, 3-phase, 60-cycle, which is transformed at the mill down to 440. Water is taken from Coffee creek by a 3 by 4-ft. flume, 9000 ft. in length, which will deliver 4000 cu. ft. of water per minute under a 107-ft. head at the power-house. The company is employing 60 men and has laid in extensive supplies and prepared to run during the winter. The property is well equipped with boarding-house, kitchen, dining-room, stables, and storehouse. The orebody has been stripped over a surface area of three acres, with hydraulic giants, and mining is done by the glory-hole system, except during stormy weather, when inside stoping will be resorted to. Air-drills are used, and ore is being delivered to the crusher at about 40c. per ton. When the mine is opened up better, it is expected to reduce this mining cost to 30c. per ton. The orebody varies in thickness from 40 to 90 ft., and some 400,000 tons of ore averaging $5.25 in gold and silver is now exposed.

Carrville, December 23.

TUOLUMNE COUNTY

(Special Correspondence.)—The New Aurum Mining Co., of which Jacob Ross is president, holds under bond the New Era group, and is planning for future operations of the mine and 10-stamp mill. The New Era and War Eagle adits, now in about 250 ft., will each be driven an additional 100 ft.; and that on the Hardtack claim, which is in 115 ft., will be extended about 50 ft. It is expected that when this work is done, enough ore will be accessible to enable the company to keep the mill in continuous operation. Only slight repairs are needed to put the mill in good working order. W. T. Carter, owner of the property,

is superintendent. An 8-ft. vein of rich ore has been discovered near the Riverside mine by Geo. Geo. Development work is in progress. The Del Monte mill will be started in a few days on the 100 tons of ore in the bins. Work is to begin soon at the Lucky Jack mine in the Basin district. The property is developed by a long adit which shows a vein of good grade ore with some rich specimens. The Contention mine, near Columbia, was recently sold to A. B. Dodd of San Francisco and S. I. Silva, of Oakland. Development work is being done at the Telegraph Line mine below the Mohican, and rich ore is being uncovered. An electric power transmission line has been constructed from Tuttletown to McCaines. It is said an Eastern syndicate has purchased the holdings of the Tuolumne River Power Co. paying therefor $65,000. According to the report Lester R. Wiles retains his interest in the new concern and will continue as manager. A three-fourths interest in the Oakland mine near Columbia, has been sold by J. W. Pitts to E. J. Harting, Leander Miller, and Charles Bryant. The Santa Ysabel mine, formerly operated by Boston people, has passed to the control of a new company whose principal stockholders are said to be San Francisco men. Local people are also interested. It is understood that operations are soon to be resumed, and that the terms of the bond call for 800 ft. of sinking and 1000 ft. of driving within two years. Several of the pocket mines on Bald mountain, north east of Sonora, have yielded heavily during the last few weeks, among them being the Birney, operated by W. H. Rehm, C. D. Elsbree, and R. and L. Fulcher; the Lewis, worked by William Lewis and William Sullinger; the Stewart, operated by D. Newman and J. Parr; and the Garrett and the Sugarman. The aggregate production in the time stated is reported to be approximately $25,000. High grade ore has been uncovered at a depth of 140 ft. in the Anaconda mine, north of Columbia; it is owned by John O'Hara and A. McKenzie. Machinery for a 10-stamp mill is being taken to the Contention mine, recently sold to an Eastern company. A large quantity of lumber and timbers is also being hauled to the property. Operations have been discontinued at the Longfellow mine, at Big Oak Flat. Some changes are contemplated in the Dutch mill, in which the present stamps will be replaced by 1000-lb. stamps. It is reported that the Big Casino Mining Co. will resume work at the Mack mine early in January.

Tuolumne, December 26.

COLORADO

CLEAR CREEK COUNTY

(Special Correspondence.) A force of carpenters is at work at the Santiago mine constructing bunk-houses to provide for a working force of 100 men by January 1. Shipments of ore will be started soon from the Big Indian mine. Stoping has been commenced on an 8-in vein of ore that is worth $70 per ton in gold and silver. H. B. Clifford & Co. have awarded a contract to A. Friedman to drive on the Bellman vein. Work will be carried on through the central adit. The same operators will also work through the Newhouse adit.— Branch & Son, leasing on the Yellowstone vein through the Lucania adit, uncovered a 4-ft. vein of ore that is worth from $15 to $55 per ton in gold and silver.— Work was resumed last week on the Dorit property, the vein in which is being sampled; some of the stuff was found to assay $12 to $14 per ton.—A carload of smelting ore was shipped last week from the Kinda mine on Bellevue mountain, the ore having assayed 2.30 oz. gold and 16 oz. silver per ton. G. F. Crawford, of Kansas City, Mo., is owner. Andrew Anderson is working on the Victor mine at the head of Virginia canyon. Shipments will begin during the next two weeks.—G. W. Ford, holding the German mine under a five years' lease, has commenced development. A shaft is to be sunk to a depth of 200 ft. —The adit on the Centennial vein, the portal of which is at the head of Rose street in Georgetown, is being driven ahead. It is stated that a body of medium-grade ore 10 ft. wide is being followed that is worth $14 per ton in gold and silver.

Georgetown, December 24.

LAKE COUNTY

The part of Leadville district known as Big Evans gulch is drained to a depth of 300 ft. by the Yak tunnel, and the 4 men who are doing deep mining there have to pump water up to that level only. The Resurrection shaft No. 2 has reached a depth of 150 ft. below the Yak level, and electric pumps are to be installed at the 1000-ft. station. It is stated that the Yak company has sunk 600 ft. below the tunnel level in Cambrian quartzite, the result having been to open big bodies of ore from which regular shipments are being made. The Climax on Fryer hill has been leased to M. L. Buchanan and others, who opened a 2-ft. vein of lead ore in the course of their development to find zinc carbonate. The Western M. Co. operating on Carbonate hill has put the Adams shaft in working order. It will be used as the hoisting shaft for the property to be being worked by this company. In the meantime the Westbone shaft will be newly timbered. This company is developing vigorously for zinc carbonate ore. Lessees on the Lafayette group, at the head of Big Evans gulch, expect to further develop the property by driving a deep adit toward Iowa gulch, the expectation being to intersect the same veins known to exist in that part of the district. The Alps-Aztec group, on Little South Evans, has been opened to some extent by an adit starting on the hillside. It is to be further developed by sinking a 250-ft. interior shaft at a point near the face of the adit. A station is then to be established at the bottom of the shaft, and exploring for ore started from that place.

IDAHO

BOISE COUNTY

The Boise King Placer Co. has acquired 480 acres of placer ground on the middle fork of the Boise river, which, according to certain tests, has a depth to bedrock of 40 ft., and contains an average of 20c. gold per cubic yard. An ample supply of water can be brought in ditches and pipes to the tract at good pressure, and it is announced that a number of hydraulic giants will be brought into use next season.

LEMHI COUNTY

The Leesburg placers, which were worked profitably in early days, are to be dredged for gold next season by Busby and Mullins. There is an area of 150 acres here which it is believed can be dredged profitably. The Kirtly Creek Gold Dredging Co., concerned in which is John Martin, of Ross, California, has purchased a tract of placer ground on Kirtly creek, five miles from Salmon, and it is announced that a dredge is to be built and put in operation there next summer. Mr. Martin and associates have prospected and tested the ground.

NEVADA

STOREY COUNTY

The stockholders of the Ophir Silver M. Co. met in San Francisco on December 20, at which the old board of directors, consisting of the following members, was re-elected: Franklin Leonard, Charles Hirshfield, B. F. Shaw, Geo. S. Sturges, A. F. Coffin, Herman Zadig, W. J. O'Connor. Thos. F. McCormick was re-elected superintendent. The superintendent's report, for the year ended November 30, showed that 9410 tons of ore was concentrated in the Kinkead mill, the gross assay value of which was $210,451.24; of this $151,401.49 was gold, and $59,049.65 was silver. The yield per ton averaged $22.36. Besides, there was sold to the Charles Butters company 1637 tons of ore of an average value of $24.65, mill tailing sold to the latter company brought $5842.37. The principal mining operations of the year were on the 2000, 2100, 2200, 2300, and 2400-ft. levels. —The report of Whitman Symmes, superintendent for the Ward Shaft Association, for the year ended November 30, accounted for the reconstruction of the shaft from the 2295 set to 15 ft. below the 2475-ft. station; a station was cut at 2000 ft., and from this place

100 ft. of driving was done toward the Gold hill workings; a station for three pumps was cut from the 2100-ft. station. The establishment of a station at 2450 ft., and driving commenced in the direction of the Combination shaft, are noted; also the cutting of a pumping station at 2475 ft., where pumps are being installed. When the latter pumps are in operation the plan will be to drive from the 2475-ft. point to effect drainage of the Combination ground. The improvement of the ventilation of the Ward shaft workings is also reported.

NEW MEXICO

SOCORRO COUNTY

(Special Correspondence.)—The Socorro mines yielded 27,700 troy ounces of silver and gold, and a large amount of concentrate from a little in excess of 3000 tons of ore milled for the month. From 20 to 30 stamps are dropping. Representatives of the Leyner company are here making competitive tests with other drill-makers.——The plant of the Ernestine M. Co. is being operated successfully. Last week 708 tons of ore were treated, the return from which was 56 sacks of high-grade concentrate, in addition to precipitate taken from the zinc-boxes.——In the Deadwood mines, cross-cutting on the 500-ft. level showed the vein to be 18 ft. wide. The pipe-line for water-supply is finished, and the mill is to be ready to start operating in January.——The Mogollon Gold & Copper Co. is building an assay laboratory and machine-shop, both of which will be finished soon. Surveys are being made to determine location for the hoist and millsite.——The Oaks company is developing a number of properties which it holds under option.

Mogollon, December 23.

OREGON

JOSEPHINE COUNTY

The Alameda M. Co., which recently completed its smelting plant, has deferred blowing in its furnace until the auto-truck road is finished from Leland to Alameda, when coke can be hauled in more cheaply. Wagon roads have been made nearly impassable by heavy rains. The Allen mine, adjoining the Alameda, was sold recently to the Alameda company by the Standard Metals Co. of Portland. These mines and the smelter are in Galice district.——The Oriole mine is well developed and equipped. Adit No. 4 is being driven to cut the lode at a depth of 900 ft. It has been advanced 700 ft. and it is expected to reach the vein 200 ft. ahead. A car of ore recently shipped to Tacoma sampled $204.20 per ton.

UTAH

JUAB COUNTY

The Centennial-Eureka M. Co. has electric-driven pumps which are lifting 1000 gal. of water per minute from the 2200-ft. level. The mine is dry down to the 2100-ft. level. ——Work at the Eagle & Blue Bell mine, at Eureka, is in charge of William Owens. The new shaft has stations at 700, 800, and 900-ft. points, from which levels have been driven to the orebodies. Ore being shipped is mined on the 800, 1100, and 1200-ft. levels.

SALT LAKE COUNTY

The North Utah M. Co. is preparing to operate the Redwing mill, situated at the mouth of Markham gulch, Bingham district, as a custom plant. It will be in charge of H. F. Widdicombe, and a beginning is to be made on lead ore from the Yampa mine. The plant has been partly reconstructed and newly equipped, and has the capacity of 200 tons per day.——The Brooklyn mine, belonging to the Bingham Mines Co., has a 12-ft. body of lead ore, which was opened by driving a winze from the 1600-ft. level. A station has been cut at the base of the winze and driving will be started in ore. The mine is in Upper Car Fork, Bingham district.——The Bingham-Newhaven company paid a dividend of 20c. per share this month, amounting to $45,800.

SUMMIT COUNTY

The Daly-Judge M. Co. has gained access to the 1600-ft. level in its Park City mine. This level was submerged for a number of years, and has been unwatered by pumping, supplemented in the last few weeks by a connection of this level with the Daly West drainage system.——The Silver King Coalition Co., under the superintendence of George D. Blood, has applied electric haulage to the 1300-ft. level and the Alliance adit level, which nearly completes the electrification of the property.

CANADA

BRITISH COLUMBIA

(Special Correspondence.)—The Ikeda Mines, Ltd., of Vancouver has taken a bond on the property formerly operated by a Japanese company, situated on Moresby island, of the Queen Charlotte group, 500 miles north of Vancouver. The property was considerably explored during last summer by diamond-drilling and other underground work, and it is now decided to proceed with development and mining ore. The ore occurs as oxides and sulphides of iron and copper, carrying gold and silver, in lenticular masses. The Japanese mined only the high-grade ore, but the company now in control intends to equip the mine in such a way as will enable it to work the low-grade ore and mine a large tonnage. The work is under direction of Andrew G. Larson, consulting engineer.

Vancouver, December 14.

CENTRAL AMERICA

NICARAGUA

(Special Correspondence.)—The Babilonia mine, situated in La Libertad mining district, has been sold by J. M. Hall, G. L. Carlisle, and J. Santos Zelaya to the Oroya Exploration Co., of London, which has been operating the mine during the last 18 months under a limited option. J. A. Willey, who was manager during that period, did 5000 ft. of development and obtained enough revenue to pay all expenses of development and operating by milling ore in a single pneumatic-stamp mill. The mine is on the mother lode of the district.

Managua, November 30.

MEXICO

CHIHUAHUA

La Republica Mining Co., operator of the Republica mine and mill in Rayon district, reports 1140 tons of ore crushed for November, the value of metals extracted amounting to ₱83,131 the operating costs were ₱51,605, the capital expenditure having been ₱4689. J. Gordon Hardy is consulting engineer; the office of the company is at El Paso.——The regular quarterly dividend of 2% has been declared by the Rio Plata Mining Co., payable December 29.

SINALOA

The Mazatlan smelter concession has been purchased by the Pacific Smelting & Mining Co., which owns the plant at Fundicion, Sonora, and, through one of its subsidiaries, the smelter at Guaymas. It is announced by Courtenay De Kalb, the general manager, that a large reverberatory plant is soon to be erected at Mazatlan.

SONORA

The Mexican-American Smelting & Refining Co., which owns the smelter at Guaymas, is to install a Huff electrostatic plant for cleaning up the zincky concentrate of the west coast, thus avoiding the penalty on zinc for the shipper, and enabling him to sell the zinc concentrate, charging to it the milling costs and brokerage for marketing. Courtenay De Kalb, the president of the company, states that the lead bullion produced probably will be shipped direct to Antwerp; that the coke supply will be obtained partly from Australia and partly from China. The company has 4000 tons of ore now in its yards and is ready for business. The same company has purchased the Southern Pacific lead-silver mine, at Tesia, near Navajoa. The Pacific Metallurgical & Refining Co., whose principal plant is at Fundicion, has purchased the Morismenia copper-gold mine situated close to Navajoa. George W. Dean, of St. Louis, has become superintendent of the Guaymas smelting plant.

Book Reviews

Any of the books reviewed in this department may be obtained from the Mining and Scientific Press.

Qualitative Chemical Analysis. By J. L. D. Hinds. Pp. viii + 207. Index. Chemical Pub. Co. Easton, Pa. Price $2.

A new treatise on qualitative analysis from the standpoint of ionic solubilities and mass action. It preserves all the features and excellence of the old methods while introducing the student to the newer view of chemical activity and recent explanations of analytic reactions and phenomena. It contains many tables which aid and simplify the work of qualitative determinations.

Richardson's Manual of Mexican Mining Law. By D. A. Richardson and Frank W. Doan. Pocket edition. Pp. 382. Index. W. H. Courtright, Denver. Price, bound either in buckram or flexible black leather, $3.

This little volume on the mining laws of Mexico is the latest publication devoted to this important matter. There have been numerous changes in the Mexican laws regarding the acquisition of mining property in that republic, and Richardson's Manual is right up to date. It contains all the statutes pertaining to corporations, mines, and mining in Mexico, in effect in 1910. The work is in English and contains an excellent Mexican-English vocabulary of words most commonly employed in mining business in Mexico. The various blank forms in use in Mexico in mining transactions are given in both English and Spanish, which makes the book particularly useful to those unfamiliar with Spanish.

Rock Drills, Design, Construction, and Use. By Eustace M. Weston. Pp. 367. Ill., index. McGraw-Hill Book Co., New York. Price $4.

This is a most interesting and useful book on a subject important to every miner, whether superintendent, drill runner, or chuck tender. It describes the evolution of the rock drill, through its many phases, from the novel but comparatively inefficient machines first introduced, to the highly efficient devices of the present day, including all types, from the small, light hammer drills to the heavy 'sluggers' employed in railroad tunneling. The various electric and rotary-drills are also described. The chapters on high explosives, rock-drilling, blasting, and maintenance of rock-drills are of great value, as well as those on drifting, stoping, and shaft-sinking. Mechanical drill-sharpening machines and their use are described, which adds value to a thoroughly practical treatise by a practical man—one who has himself run various rock-drills and learned their usefulness and present limitations.

The Prospector

This department makes a charge of 25 cents to subscribers not in arrears and $3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

J. H. M., Pocatello, Idaho. Diabase.

E. A. F., Polaris, Arizona: Massive serpentine.

B. F. N., Ocampo, Chihuahua, Mexico: No. 1, syenite; No. 2, diorite.

F. J. J., Millett, Nevada: Fossiliferous limestone. No phosphate present.

E. M. S., Lang, California: Specimens are ferrous silicate, similar to glauconite.

J. A. H., Clifton, Arizona: No. 1, serpentinized rock; No. 2, quartz-porphyry, with a little epidote.

C. O. E., Dayton, Nevada: Quartzite containing tetrahedrite (gray copper) and oxidized pyrite.

A. F. F., Tepic, Mexico: No. 1, tremolite; No. 2, rhyolite; No. 3, quartz-porphyry, or rhyolite, with pyrite and manganese-stained base; No. 4, altered rhyolite; No. 5, pyrite and arsenopyrite.

Recent Publications

Origin of the Pegmatites of Maine. By Edson S. Bastin. From Jour. of Geol. Pp. 25. Ill. University of Chicago, 1910.

Origin of Certain Adirondack Graphite Deposits. By Edson S. Bastin. From Economic Geology, March, 1910. Lancaster, Pennsylvania.

The Underground Waters of North Central Indiana. By Stephen R. Capps. U. S. Geol. Surv. Water-Supply Paper 254. Pp. 279. Ill., index. Washington, 1910.

Cananea Mining District of Sonora, Mexico. By S. F. Emmons. From Economic Geology, June, 1910. Lancaster, Pa. Describes the geology of these large and valuable copper deposits.

Organization and Equipment of the Canadian Copper Co. By Alexander Gray. Pp. 40. Ill. Gives history and organization of the company, and development and equipment of mines and metallurgical plants.

Papers and Reports Relating to Minerals and Mining in New Zealand. By Roderick McKenzie, Minister of Mines. Pp. 138. Ill., maps, index. Wellington, N. Z., 1910. The annual report of the Minister of Mines for 1909.

A Proposed Classification of Petroleum and Natural-Gas Fields, Based on Structure. By Frederick G. Clapp. From Economic Geology, Sept., 1910. Lancaster, Pa. Describes the occurrence of oil and gas under varying geological conditions.

The Natural Classification of Igneous Rocks. By Whitman Cross. From Jour. Geol. Soc., Aug., 1910. Pp. 36. Discusses the various bases of classification of igneous rocks, and advises an arbitrary classification, as natural boundaries do not exist.

North Dakota Lignite as a Fuel for Power Plant Boilers. By D. T. Randall and Henry Kreisinger. U. S. Bureau of Mines, Bull. 2. Pp. 42. Ill. Washington, 1910. Results of numerous tests show that this fuel, though low grade, may be used economically under boilers that generate their full-rated capacity of steam—all of which makes for conservation of the most practical character.

Contributions to Economic Geology, 1908. Part II. Mineral Fuels. By M. R. Campbell and others. Bull. 381, U. S. Geol. Surv. Pp. 559, Ill., index. Washington, 1910. This volume contains numerous interesting and valuable papers, many of which have been separately issued in advance. It is striking, none the less, that the geologists working on coal are apparently just a year behind their fellows who have been studying ore and whose report for 1909 is being distributed at the same time as is this.

Contributions to Economic Geology, 1909. By C. W. Hayes, Waldemar Lindgren, and others. U. S. Geol. Surv. Bull. 430. Pp. 653, Ill., index. Washington, 1910. This is the eighth in the series of annual volumes that began with No. 213 in 1902, and is a most useful report. In it may be found short articles giving in condensed form the main results of the investigations carried on in 1909, except those covering fuels and Alaska, for which companion volumes are to be issued. Among the longer and more notable papers in Bull. 430, are 'The Occurrence of Copper in Shasta County, California,' by L. C. Graton, and 'Preliminary Report on the Phosphate Deposits in Southeastern Idaho and Adjacent Parts of Wyoming and Utah,' by H. S. Gale and R. W. Richards. Both these papers are notable contributions to knowledge along lines that are of much present interest. Scarcely less valuable are some of the shorter articles which cover an unusually wide range. Many of them have already been given separate notice.

Personal

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

C. C. Broadwater is at Los Angeles.

S. S. Sorrensen is in San Francisco.

Whitman Symmes is in San Francisco.

A. Roy Heise was in San Francisco last week.

George H. Garrey was at Los Angeles recently.

C. B. Lakenan has been visiting San Francisco.

J. A. Holmes spent Christmas in North Carolina.

S. F. Shaw is returning to New York from Costa Rica.

C. W. Purington has returned to London from St. Petersburg.

Thomas T. Read has been visiting the gold mines of France.

Huxley St. John Brooks has gone to the Philippine Islands.

E. V. Daveler has left Alameda, California, and is now at Garfield, Utah.

C. F. Tolman, Jr., has been appointed as Territorial Geologist of Arizona.

F. Oskar Martin has returned to San Francisco from the oilfields around Bakersfield.

George H. Gruss is in San Francisco from Gennessee Valley arranging to reopen the Gruss mine.

Henry S. Lewis, of Washington & Lewis, sailed for Brazil December 20.to be gone about four months.

John F. Armstrong has been nominated for another term as Register of the Land Office at Sacramento.

W. H. Blackburn, mine superintendent for the Tonopah M. Co., was in San Francisco, during Christmas.

Maurice H. Hare has been appointed manager and Western representative of the Idaho Company, Ltd., with offices at Spokane, Washington. The Idaho Company is operating two gold dredges at Pierce, Idaho.

David Cole has resigned as assistant general manager for the Cananea Consolidated Copper Co. to accept the position of manager of the Ray Consolidated Copper Co.'s business in Arizona, with headquarters at Hayden, Arizona.

C. S. Herzig and W. Murdoch Wiley have resigned as president and vice-president, respectively, of the Constant-Herzig Co. Mr. Herzig has taken over the mining contracts and will continue the business heretofore carried on by the mining department of the company.

OBITUARY

Joseph Gruss, a California pioneer who has worked mines in Plumas county, California, for thirty or more years, and also at Virginia City, Nevada, died at his home at Gennessee Valley, California, on December 21, at the age of 66 years. He was a native of Alsace.

Walter L. Pierce, who for 32 years had been connected with the Lidgerwood Manufacturing Co. and for 29 years its secretary and general manager, died suddenly of heart failure at his winter home in the Hotel St. Andrews, New York City, December 10. He was a son of John F. Pierce and was born at Dorchester, Massachusetts, on June 8, 1855. His parents survive him and he leaves a widow, a son, a brother, and a sister. Mr. Pierce's death was entirely unexpected. He had suffered for several years with nervous troubles, but by devoting much of his time to out-of-door pursuits he had apparently recovered. He was known to a wide circle of personal and business associates. He was remarkable as an organizer and so perfect was his work that no detail of the great business which grew up under his hand was neglected during his long absences from his desk while seeking health. Besides his connection with the Lidgerwood Mfg. Co. he was treasurer of the Hayward Co. and of the Gorton-Lidgerwood Company.

Market Reports

LOCAL METAL PRICES.

San Francisco, December 29.

Antimony	12–12¾c	Quicksilver (flask)	44½–45
Electrolytic Copper	14½–15¼c	Tin	41 – 42½c
Pig Lead	4.75–5.70c	Spelter	7–7¼c

Zinc dust, 1400 lb. casks, per 100 lb., small lots $9.50 – 9.75; large $7.50 – 8.50

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

Date.	Electrolytic Copper.	Lead.	Spelter.	Silver, per oz.
Dec. 22	12.58	4.50	5.44	54⅝
" 23	12.58	4.50	5.44	54⅜
" 24	12.56	4.50	5.44	54⅛
" 25	Sunday.	No market.		
" 26	Holiday.	No market.		
" 27	12.58	4.50	5.44	
" 28	12.58	4.50	5.44	53⅞

ANGLO-AMERICAN SHARES.

Cabled from London.

	Dec. 22. £ s. d.	Dec. 29. £ s. d.
Camp Bird	1 12 6	1 13 0
El Oro	1 6 3	1 6 9
Esperanza	1 17 6	1 19 3
Dolores	1 5 0	1 5 0
Oroville Dredging	0 6 9	0 6 3
Mexico Mines	7 17 6	8 0 0
Tomboy	0 16 6	0 15 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

	Closing prices, Dec. 29.		Closing prices, Dec. 29.
Adventure	$ 7	Mohawk	$ 45
Allouez	38	North Butte	29⅛
Atlantic	5	Old Dominion	37½
Calumet & Arizona	48	Osceola	127
Calumet & Hecla	540	Parrot	11½
Centennial	15½	Santa Fe	1⅝
Copper Range	67	Shannon	11⅛
Daly West	3⅜	Superior & Pittsburg	13⅞
Franklin	9	Tamarack	50
Granby	37	Trinity	4⅛
Greene Cananea, ctf	67⅛	Utah Con	13⅜
Isle Royale	16¾	Victoria	2
La Salle	6½	Winona	8¾
Mass Copper	8	Wolverine	116

(By courtesy of J. C. Wilson, Mills Building.)

MINING STOCK QUOTATIONS—NEW YORK

(By wire from Catlin & Powell Co., New York.)

	Closing prices, Dec. 29.		Closing prices, Dec. 29.
Amalgamated Copper	$ 62⅛	Miami Copper	$ 19½
A. S. & R. Co.	73¼	Mines Co. of America	5¾
Braden Copper	37⅛	Montgomery-Shoshone	1/16
B. C. Copper Co	7⅛	Nevada Con	18⅜
Butte Coalition	17⅛	Nevada Utah	⅞
Chino	21¾	Nipissing	10⅞
Davis Daly	1⅝	Ohio Copper	1⅝
Dolores	5	Ray Central	2
El Rayo	4	Ray Con	18
Ely Central	1/16	South Utah	1
First National	2¼	Superior & Pittsburg	13⅞
Giroux	6¼	Tenn. Copper	34⅝
Guanajuato Con	¼	Trinity	4¾
Inspiration	8⅝	Tuolumne Copper	4⅛
Kerr Lake	6¼	United Copper	4¼
La Rose	4½	Utah Copper	44¾
Mason Valley	9⅞	Yukon Gold	3¾

SOUTHERN NEVADA STOCKS.

San Francisco, December 29.

Atlanta	$ 13	Mayflower	$ 4
Belmont	4.55	Midway	16
Booth	8	Montana Tonopah	83
Columbia Mtn	3	Nevada Hills	2.15
Combination Fraction	17	Pittsburg Silver Peak	60
Fairview Eagle	35	Rawhide Coalition	3
Florence	1.40	Rawhide Queen	
Goldfield Con	8.45	Round Mountain	40
Gold Kewenas	6	Silver Pick	6
Great Bend	2	St. Ives	15
Jim Butler	25	Tonopah Extension	99
Jumbo Extension	25	Tonopah of Nevada	8.15
MacNamara	19	West End	54

(By courtesy of San Francisco Stock Exchange.)

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The contractor who buys "hurry-up" purposely-cheapened-by-substitution wire rope—**can't.**
His mistakes come high.
The damage suit jury sees to **that.**
And right here is where every buyer and user of wire rope must do some thinking.
There are just two ways in the wide world to cheapen wire rope.
(1) Rush the ropes through kinks, twists, imperfections and all, or—
(2) Substitute cheap material.
The buyer who insists on low prices forces the maker to one or both of these evils.
That is all there is to the cheapening problem absolutely n-i-l.
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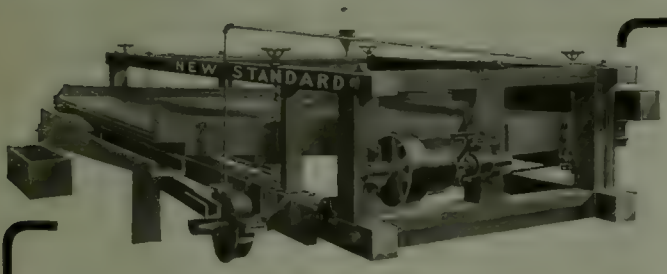

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